DOCUMENT RESUME

ED 384 487 SE 055 070

AUTHOR	Mickelson, Belle; And Others
TITLE	Discovery: An Introduction. Alaska Sea Week Curriculum Series. Alaska Sea Grant Report 83-6.
INSTITUTION	Alaska Univ., Fairbanks. Alaska Sea Grant Program.
SPONS AGENCY	National Oceanic and Atmospheric Administration (DOC), Rockville, Md. National Sea Grant Program.
REPORT NO	ISBN-1-56612-019-5
PUB DATE	Jun 83
CONTRACT	NOAA-NA82AA-D-00044
NOTE	161p.; Volume IV was never produced. For related documents, see SE 055 071-075.
AVAILABLE FROM	Alaska Sea Grant College Program, University of Alaska, P.O. Box 755040, Fairbanks, AK 99775-5040 ($6.50; quantity discounts).
PUB TYPE	Guides - Classroom Use - Teaching Guides (For Teacher) (052)
EDRS PRICE	MF01/PC07 Plus Postage.
DESCRIPTORS	*Activities; Animals; Birds; Curriculum Guides; Environmental Education; Habitats; *Interdisciplinary Approach; *Marine Biology; *Marine Education; Natural Sciences; Oceanography; Primary Education; *Resource Units; Water Resources; Wetlands; Worksheets
IDENTIFIERS	Alaska; *Aquatic Life; Aquatic Organisms; Seashore Ecology; Seaweed

ABSTRACT

This curriculum guide is the first (Series I) in a six-volume set that comprises the Sea Week Curriculum Series developed in Alaska. As a basic introduction, this first book in the series lends itself to the kindergarten level but can be adapted to preschool, secondary, and adult education. Six units contain 32 activities with worksheets that cover the following topics: (1) the ocean; (2) wetlands; (3) marine animals; (4) seashore animals; (5) seaweed; and (6) birds of wetlands, rivers, and seashores. An introduction provides information designed to help teachers become familiar with the contents of the curriculum guide and to assist in planning. Each unit contains information on student objectives, and activity background, vocabulary, materials, and procedure. Activities engage students in interdisciplinary projects that involve the skills of communicating, modeling, tasting, counting, listening, drawing, painting, writing, comparing, role playing, identifying, and observing. An annotated bibliography contains 118 resources divided according to unit. A packet of teacher reproducible worksheet masters accompanies the curriculum guide. (LZ)

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Alaska Sea Grant College Program
University of Alaska
Fairbanks, Alaska

Alaska Sea Week Curriculum Series: I

Discovery
an Introduction

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Alaska Sea Grant Report 83-6

June 1983

Acknowledgments

The seven volumes comprising the new Sea Week Curriculum Guide Series are an expansion and revision of a curriculum project begun by Juneau parents 15 years ago. Publication of this volume is the result of work sponsored by the Alaska Sea Grant College Program, cooperatively sponsored by the National Oceanic and Atmospheric Administration's Office of Sea Grant and Extramural Programs under grant number NA82AA-D-00044, projects E-70-08 and A-75-01, and by the University of Alaska with funds appropriated by the State of Alaska; Alaska Department of Environmental Conservation, National Marine Fisheries Service, University of Alaska Cooperative Extension Service, Alaska Department of Fish and Game, and Alaska Department of Education.

Special acknowledgement for Discovery illustrations goes to Renee Patten; and for assistance in preparing material for this volume to Mary Crea, Heide Thompson, Mike Cline, Rick Ladd, Chris Thomas, Jan Vrsalovic, Kathy Amerman, Nancy Mitchell, Larry and Nancy Rockhill, Betty Leonard, Jay Satterfiels, Laurie Schoenberger, Lynn Fry, and Barbara Ward.

Technical reviews of the Discovery material were, for Unit I (The Ocean), Raymond Hadley, associate director of the University of Alaska's Institute of Marine Science; for Units Two and Six (Wetlands and Birds), Dr. Peter Mickelson, assistant professor of wildlife management at the University of Alaska, Fairbanks; for Unit Three (Marine Mammals), John Burns, marine mammals coordinator for the Alaska Department of Fish and Game; for Unit Four (Seashore Animals), Dr. Howard Feder, professor of marine science at the University of Alaska, Fairbanks; for Unit Five (Seaweed), marine biologist Linda Schandelmeier of Fairbanks.

We want to express our thanks to Annie Calkins for assistance in critiquing this guide. Jim King, waterfowl biologist with the U. S. Fish and Wildlife Service, helped with Units Two and Six (Wetlands and Birds). Dr. Earl Clark, Associate Professor, University of Alaska, Juneau, and his students Linda Edmunson and Joyce Roloff, plus Nancy Barr, Mary Lou King, and Belle Mickelson--compiled the bibliographies. Thanks, too, to Ruth Mai who contributed the Sea Week Song. Virginia Eggert should be credited for the worksheet illustrations.

The 1988 reprinting of this volume was made possible by support from the State of Alaska Department of Education.

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Former ISBN was 0-912006-31-5

Current ISBN is 1-56612-019-5

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Introduction

Sea Week is a celebration. It's one of those rare school programs that can saturate a class with learning opportunities without intimidating a single child. The hundreds of teachers now participating in Sea Week throughout Alaska have found it to be a highlight of the year: a week of delight and awe, intrigue and excitement. It's a week that translates classroom science, mathematics, language, history, social studies, art and music into the crash of a wave, the scuttle of a crab, the drift of a kayak, the bark of a seal, the taste of smoked salmon, the scent of a pier. The only frustrations we've found are among teachers who discover that a week isn't enough. Many have expanded their programs to a month. Several have simply given up on trying to confine Sea Week to a time, and now make use of the curriculum throughout the year. However you design your own program, we're confident that its primary ingredients - Alaska's kids and coastlines - come to you satisfaction guaranteed!

Discovery is the first of seven Sea Week curriculum guides. As a basic introduction, this first book lends itself well to a kindergarten curriculum; and Volumes II through VII are progressively more advanced. The authors hasten to add, though, that the books aren't "locked" into the particular grade levels, and have even been adapted effectively to preschool, secondary and adult education. Several factors are responsible for the versatility. One is that while student activities in each book are at grade level, the teacher background materials are written at university level, and can be transferred to the classroom at any level the teacher desires. Another is that the curriculum encourages the use of community resource experts, who can gear their talks and tours to anyone from preschoolers to retirees. A third reason for the versatility is that many of the student activities have latitude. When in Volume V I the guide suggests building model boats, for instance, it includes the pattern for a paper cutout. But the same activity can be used by high schoolers constructing complicated models, or even by adult students trying their hands at building an actual kayak!

The lives of all Alaskans are touched often by the sea: literally, aesthetically, productively. To begin with is the sheer immensity of the Alaska coastline. It stretches and twists, pounds and lies placid along two oceans and three seas for 6,640 miles - more than half that of all the contiguous United States. Islands, inlets, bays, fjords and delta regions add another 28,000 miles of saltwater shoreline for a total of 34,640 miles - a distance almost equal to twice the circumference of the earth. Alaska's continental shelf covers more than 830,000 square miles, more than 75 percent of the U.S. total. More than 90 percent of the fish caught in the U.S. come from Alaskan waters. And Alaska's coastal zones, both onshore and off shore, contain an estimated 75 billion barrels of petroleum and 380 trillion cubic feet of natural gas - amounts that would equal 50 percent of the nation's remaining petroleum reserves.

More than three-quarters of Alaska's almost half-million people live along its coastline. Their careers are generally sea-related. Grocers sell to the fishing fleet, lumbermen float their log rafts oversea to the mill, real estate salesmen get more money for property with an ocean view, and schoolteachers

find that one of the most effective ways to spark interest in a child's eyes is to turn those eyes seaward.

The bulk of Alaska's culture is so closely interlaced with the sea that in many cases the sea is Alaska culture. The seven volumes of the Sea Week Curriculum Guide series escort youngsters through the crafts, arts, music and oral and written literature of the coastal Haida, Tlingit, Koniag, Chugach, Aleut, Yupik and Inupiat to the poetry, literature and artwork of Alaska today.

And even the lives of that one quarter of Alaska's folk who don't live along the coastline are linked to the sea. They are consumers of sea products, of course; and beneficiaries of seacoast oil wealth, and even occasional visitors to the sea. But more importantly they are linked to the sea by Alaska's myriad rivers and wetlands: Alaska's vast interior, which its inhabitants call "The Golden Heart" of the state, includes hundreds of thousands of miles of rivers and streams, and 390,941 square miles of wetlands. That's two thirds of the state, all linked to the coastline by freshwater systems that serve as nurseries for Alaska's salmon and waterfowl, as transportation arteries to and from the coast, and as the nutrient-rich replenishers of the ocean currents.

It is because of such interconnections between wetlands and the sea that with this edition, the Sea Week Curriculum Guide series has been expanded to include units on Alaska's wetlands and the traditional Athabascan and contemporary peoples who inhabit them.

The resulting series is the foundation of the most comprehensive marine education program ever developed in the Northland. We hope that you will find it as valuable and motivating as it is intended. We hope, too, that through Sea Week, the youngsters of your classrooms will come to more deeply respect and appreciate the environments for which they will soon be responsible. The insights they gain in your classrooms will become the votes and legislation, the lifestyles and attitudes, the wisdom and understanding - the sea harvest - of tomorrow.

Tips for Teachers

Welcome to Sea Week! Here's a checklist of tips designed to help familiarize you with the contents of Discovery, and to assist your Sea Week planning.

- If you haven't scanned the book already, we suggest you get a sense of its format by glancing through the Table of Contents, the different units containing teacher background and student activities, the student worksheets, and the bibliography.

- Note that each unit is headed by a list of objectives that specify which activities are designed to accomplish those objectives.

- Student worksheets have been placed together at the end of the book. But they are numbered to correlate to the units they complement. Thus Worksheet 1-A is the first worksheet (A) listed among the activities in Unit 1; Worksheet 2-C is the third worksheet (C) assigned in Unit 2, and so on. Some teachers like to copy the worksheets en masse and bind them into student activity books. Other prefer to insert the worksheets into the corresponding units of the text, then distribute them one by one as the appropriate topics are covered.

- Brainstorm Sea Week ideas with other teachers and parents. Use the Sea Week Planning Sheet beginning on Page x to list the names of parents and local resource people who can help make your Sea Week a success. You'll find most people are pleased to be asked, and more than happy to help.

- Involve your bilingual staff as you identify such community resources as speakers (fishermen, net menders, whale experts, shell collectors, birdwatchers, village elders, artists) and field trip sites (beaches, harbors, canneries, seafood markets, salmon spawning streams, marshes, hatcheries, museums, birdwatching areas).

- Plan your school's Sea Week at a time best suiting your location. Teachers in southwestern, southcentral and southeastern Alaska are finding it best to consult tide tables and plan beach trips at low tide. In northern, central and western Alaska, Sea Week activities are proving most successful when there's open water, or when they are planned to coincide with a longstanding community fishing, whaling or other festival.

- Order films early, and plan well in advance for school and community events.

- Make lesson plans. Preview the units more thoroughly, selecting those activities most appropriate for your students. You may want to juggle the order to suit your existing class format. Note that we've included activities to sharpen skills in language arts, science, social studies, match, music, art and physical education so that all aspects of education during Sea Week can focus on Alaska's ocean, river and wetland environments.

- Plan your field trips. Decide on a place, time and means of transportation. Arrange to take parents, older students or resource people as helpers.

The most successful trips usually have one adult per five or fewer students. If possible, visit the field trip site ahead of time with your helpers.

- Task cards and field checklists are included within each unit. These aids can be copied and given to helpers for use as field study and activity guides.

- Develop an outline for your field trip. Suggested inclusions:

    A. Discovery and exploration time.

    B. Structured learning activities.

    C. A snacktime.

    D. Organized games, treasure hunts, litter pickup.

    E. Review of the day's events (which can be as simple as having each student and parent telling what he or she enjoyed most).

- One or more parents or teacher coordinators can be appointed to assist in scheduling speakers, movies and field trip transportation, and in presenting your Sea Week plan to school district officials for approval.

- Field trips and other Sea Week activities make bright news features. Consider contacting your local newspaper, television or radio station. Teachers usually find that reporters generally enjoy going to the beach as much as do the students!

- Check through the "materials" list of each unit; then make, buy, scrounge or order any equipment you might need.

- Write a letter to parents. Include requests for field trip assistants, resources, ideas, and permission slips.

- Promote conservation - the protection and wise use of our natural resources. Ask children how they can help take care of animals and plants they encounter in their field and classroom studies. Through their concern for life and habitat, have students develop some rules: step softly and quitely while observing animals, replace rocks or logs after looking underneath (to keep the roofs on animal homes), handle animals gently, fill in holes after looking for clams (to prevent suffocation of the animals next door), and don't take live animals or plants away from their homes.

- So that future children can enjoy the area, too, it is a good idea to discourage personal collections of any natural items, living or nonliving. Limit collections to educational purposes such as art projects or aquarium study - and return any living animals to their natural habitats as soon as possible.

- Encourage students to leave the beach, river or wetland cleaner than when they arrived. A specific litterbug activity at the end of Unit Four is designed for pre-field trip use.

- Remember safety. For field trips, have a plan for keeping students in groups through a buddy system or adult supervision. Take a first aid kit. Discuss hypothermia. Take matches and tinder for starting a warm-up fire if necessary. Make sure students dress warmly and take extra clothes and rain gear (plastic trash bags will do in a pinch). And wear life jackets on boat trips.

- If your school is inland, consider exchanges with coastal schools. Send them a selection of items found on your field trips, a class story, or perhaps photos. Maybe they can send you shells, seaweed, sand, or a beach mural. Try to get a saltwater aquarium for your school. The wetlands and bird units should be particularly applicable to your area. Most seaweed activities can be done with frozen or dried seaweed. The ocean and seashore units have many activities that don't require an actual ocean. And of course all students love to study whales, whether they live in Fort Randall or Fort Yukon!

- Follow up your Sea Week with thank-you notes, student evaluations, and a brief report or copy of a news article for your administrators.

- Photocopy your lesson plans and stick them in this guide, so you'll be ready for next year!

Sea Week Planning Sheet

Resource People: Speakers, craftsmen, field trip leaders.

Name	Expertise	Phone

Field Trip Possibilities:

Location	Habitat (Beach, river, pond)	Transportation Arrangements

Volunteers: To help with field trips, seafood meals, classroom activities.

Name	To Help With:	Phone

Films:

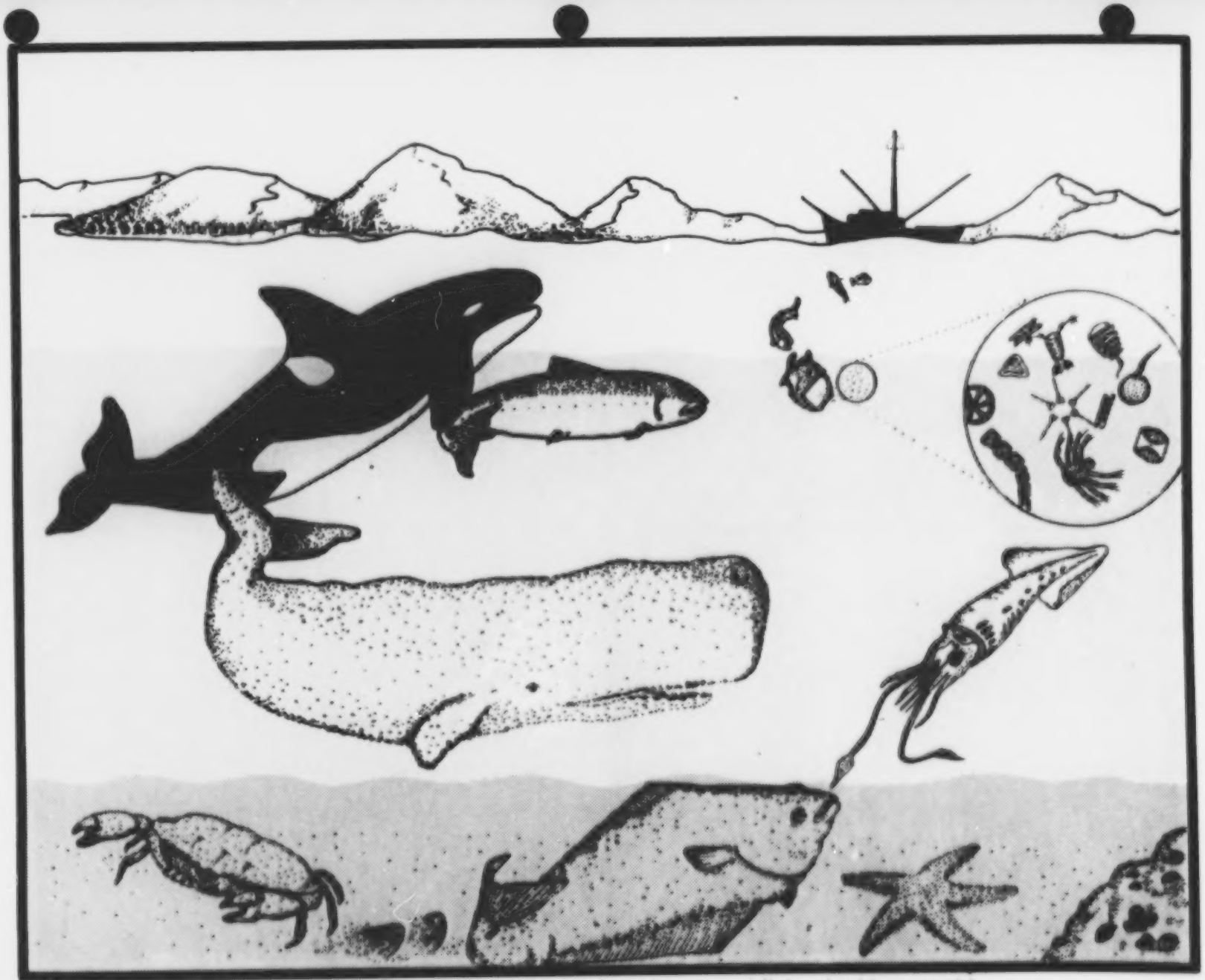
Call Number	Title	Source	Rating

Books:

Call Number	Title	Source	Rating

Equipment:

Type	Purpose	Source



The Ocean. Clockwise from upper left: killer whale, silver salmon, rockfish, plankton, squid, barnacles, starfish, halibut, crab, sperm whale.

Unit One
The Ocean

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Objectives:

To help students:

- Recognize that a large part of the earth's surface is water (Activity 1).
- Discover that ocean water is salty (Activity 2).
- Learn that tides operate "on a clock" (Activity 3).
- Tell how sand and rocks can be moved by ocean waves (Activity 4).
- Finger paint the power of an ocean storm (Activity 4).
- Make model boats similar to ocean craft (Activity 5).
- Learn about people who make a living from the sea (Activity 6).
- Taste a variety of seafoods (Activity 7).
- Recognize through a trip to the seashore, and through pictures poems that the ocean is beautiful and deserving of respect.(Activity 8).

The sea is an integral part of Alaskan life. We turn to it for food, for transportation, for recreation, for inspiration. Every stream eventually meets the sea. And each year salmon follow the rivers inland.

"The sea covers 71 percent of the earth's surface. It was the cradle of life, and it still nurtures life. Every tear we shed is a reminder of our origin; indeed a coincidental 71 percent of the human body consists of salty fluids. Eight percent of the world's animals and 50 to 80 percent of the earth's plant growth come from the oceans. Its green one-celled plants--phytoplankton--supply more than half of the atmospheric oxygen that sustains life."

-from "This Fragile Earth," Part VI, International Wildlife, Vol. 7, No. 3.

The sea is more than just interesting; we depend on it for life. And it depends on us for life; for while the oceans are the earth's most vast resource, they are also a fragile resource. Children who learn to appreciate and respect the oceans today will be the adults responsible for keeping the oceans safe and productive tomorrow.

Activity 1
Sea Size

Vocabulary:

- shore
- ocean
- sea
- shoreline
- coast
- seacoast
- beach
- seashore

Materials:

- crayons
- globes or wall maps of the world
- Sea Week Activity Book (Page 107)
- worksheet: ...Bottom of the Ocean (1-A)

Procedure:

1. Introduce students to the idea that the globe represents what our world looks like and that it is divided into land and water. It may help to point out to children the area which is the "lower 48." Also point out Alaska.

2. Turning attention to the oceans, have students (One globe per four youngsters works best.) trace with their

fingers the edges of the ocean so that they have a good idea of which area is ocean and of how large it is.

3. Still using the globes or maps, ask the children:

Is there more land or more water?

(The sea covers 71 percent of the earth's surface and that figure doesn't include lakes and rivers.)

What else would you like to learn about the ocean?

(Take notes or make a list on the board to help guide your study in the rest of the unit.)

Where do the land and water touch?

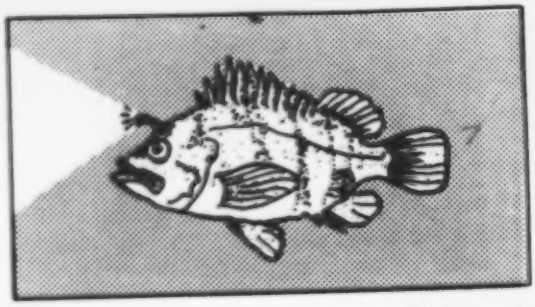
(The word "shore" means the edge of the sea. The word "shoreline" describes the long line of the shore. Other possible words to use are beach, seashore and seacoast. If the children are unfamiliar with these terms, introduce them gradually. Perhaps start a list of vocabulary words. See if the children can say "she sells seashells down by the seashore" slowly at first, then rapidly.)

What do you think is under the oceans?

(The "ocean floor" is the name for the bottom of the ocean.)

What do you think it looks like on the ocean floor?

(There are many features on the ocean floor similar to those on land--mountains, valleys, plains--but the kinds of plants and animals are all different.)



Do you think it is light or dark at the bottom of the ocean?

(In the depths, it is very dark and cold. Sunlight can penetration only short distances. Light disappears not all at once, but gradually, color by color. First to go is the red light, at about 60 feet. By 1,000 feet all that is left is some weak blue light. Below 1,700 feet the water is pitch black, at least to human eyes. Some fish have huge eyes to detect the faintest glimmer of light. Other fish, and some shrimp are blind, while still other fish carry their own flashlights.)

4. Tell the children that they will have a chance to make a Sea Week Activity Book as a record of their ocean studies. Have them color the Sea Week Activity Book cover. They might want to write a class fantasy story about the boy and octopus on the cover. Ask them to compare the boy riding the octopus to their own ocean adventures.

Remind them that real adventures sometimes can be more exciting than make believe.

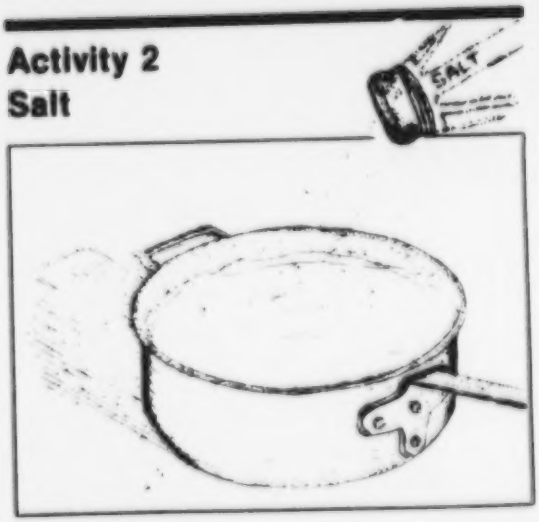
5. Have students color the Bottom of the Ocean worksheet. Explain that they may want to color their picture black at the bottom since it's so dark down there. The ocean in some places goes much deeper then the tallest mountains rise high. Would they like to add some additional fish?

Additional Activities:

1. Art: Have students draw or paint their own versions of what they think it's like at the bottom of the sea.

2. Language Arts: Make a "story chart" based on the children's drawings of the bottom of the sea - each picture being an episode.

Activity 2
Salt



Vocabulary:

- salt water
- fresh water
- sea water

(Note: These are noun forms. When written as adjectives, the words are joined: saltwater, freshwater, seawater.)

Materials:

- sea water (or salted water)--boiled the day before for ten minutes as a health precaution
- tap water
- two small containers per group of four children
- two shallow pans

Procedure:

1. Before setting out the containers of tap and sea water, ask the children to predict whether or not they will find a difference between the two kinds of water. If they are not sure that there will be any difference, encourage them to think about experiences they have had with fresh water (baths, drinking fountains, streams) and with

sea water, and see if such remembrances bring to mind any differences.

2. Divide the class into small groups of four and give each group one container with tap water and a second container with sea water. The containers should be marked with masking tape so that only the teacher can tell by the marks which is which.

In the following order, have students look at, feel, smell and taste the two samples. As they do, ask the following questions about each one:

Can you tell by looking at the water which is sea water and which is from the tap?

Can you feel a difference in the two? How does each one feel?

Can you tell by smelling which is which?

Can you tell by tasting which is which?

3. After all the children have used their senses to examine the samples, tell them that sea water is also called salt water. Can they tell you why? Make a chart with the children about the differences in how salt water and fresh water can be used. Label one half fresh water and label the other half salt water. Brainstorm and list all the differing uses they can think of. (Land plants and animals--including man--must have fresh water in order to thrive and survive, but fresh water may be lethal to sea plants and animals that require a salt water environment!)

4. Now pour tap water in one shallow pan and an equal quantity of sea water in another. Over a three-day period, observe what happens. Each day have students look at what is left in each pan. On the third day have them taste what is left in the pan containing sea water. Explain that when water evaporates from the ocean, the salt is left behind.

Activity 3
Tides

Background:

The best way for students to understand tide is to observe it at the beach. Tides also can be shown in the classroom on a beach mural or imaginary "wall ocean."

Tides are the regular rhythmic rise and fall of great bodies of water. They are caused by the gravitational pull of the sun and moon. The moon is much closer, so its pull is about twice as strong as that of the sun. Oceans facing the moon bulge toward the moon, and the oceans on the other side of the earth bulge toward the sun. Thus there are two regions of high tide at the same time - but the one on the moon side is the highest. Between high tides are the oceans from which the water is drawn to make them, creating low tides in those areas. Southeast and South-central Alaska have two low tides per day. Western Alaska has one low tide a day. And in Northern Alaska, tides are barely noticeable at all!

Vocabulary:

- tide

Materials:

- stake or stick
- masking tape
- felt tip marker
- beach mural
- tide table as a teacher reference
- worksheet ...Tide (1-B)

Procedure:

1. Take a trip to the beach, using the following Field Trip Activity Card:

Tide

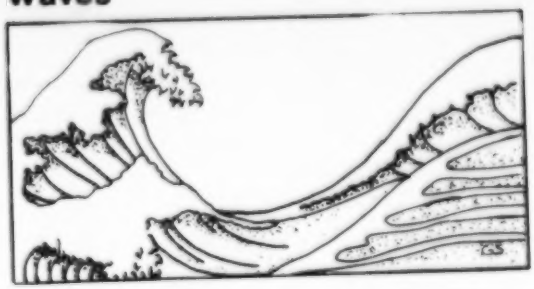
Leader: Observe the level of the water when the group arrives. Push a stake or stick into the beach at the water's edge. Check it every hour to observe what has happened to the water level. Ask the children if the tide is coming in or going out. Encourage them to imagine what will take place:

- Will their toes get wet?
- Will they have to swim for higher ground?
- If the tide is going out, how far out do the children think they'll be able to walk? What will they be able to see that can't be seen now?

2. Back in the classroom, put a six-foot strip of wide masking tape vertical on a wall. Mark it at one foot, two feet, and so on. Use a tide table (available from banks all over the state) to portray the hourly rising and falling of the tide. The children might have to learn to swim quickly!

3. Use the Tide worksheet to talk about the effects of the tide on life along the coast. If possible, take some pictures of local landmarks at low tide and high tide to show the children.

Activity 4
Waves



Background:

The water at the top of the ocean is called the surface. Wind blowing against the surface causes waves. Large waves can cause great damage and change the appearance of beaches. Even small waves are capable of exerting great force. If your beach is quite calm, you might be on the lookout for a passing boat that will create waves to show the children.

Vocabulary:

- waves
- wind
- storm
- calm

Materials:

- large basin
- sand
- water
- sandpaper
- small rocks or pebbles
- magnifying lens

Procedure:

1. Place the sand and some of the pebbles or small rocks in the bottom of the basin. Add the water. Now have the students make their own waves. Do the "waves" change the appearance of the

ocean bottom? (Beaches are steeper in the winter due to the constant waves and storms. The beach slope evens out in summer when the waves are smaller.) Are the pebbles round or sharp? Smoothness means that the water has rounded the edges. How much work would it be for one of us to smooth or round a rock? Would the children like to try to wear an edge smooth with sandpaper?

2. Field Trip Activity Cards:

Sand

At the beach, watch the waves coming in. Ask the children:

- How many are there?
- How big are they? What do they do as they come in? (They roll over.)
- Can you do that too?

Let the children jump in the waves or run back and forth as the waves go in and out. Examine any stones and boulders on the shore and note how smooth they are.

- What might have made them so smooth? (Water rubs them against the sand.)

Have each child pick up a handful of sand and let it run through their fingers. Ask what they think sand is and where it came from. Tell them that sand is created by the constant force of the sea grinding up shell and rock. Take a small sample back to look at with a magnifying glass or under the binocular scope.

Mud

Have the children pick up some mud. Rub it back and forth. Ask them:

- What does it feel like?
- Where did this come from? There must be a river near by that the mud particles (silt) floated down as it came off (eroded) from the river banks and hills. Then that mud in the water (silt) settled out right here. What stories do you think it would tell if it could?

Waves

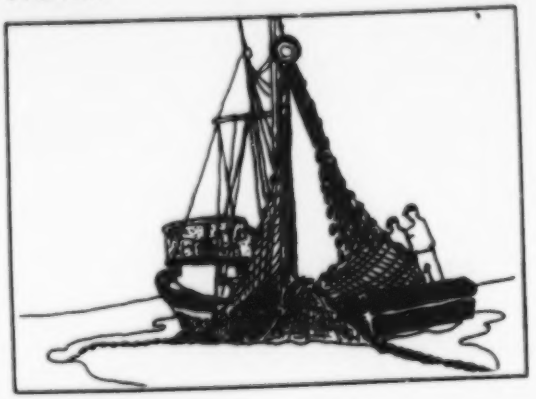
Bundle the class up in lots of warm clothes and rain gear and take them to the shore on a stormy day to observe the power and excitement of the waves first hand. Waves are capable of tossing great logs and other debris into the air, so although the sea is impressive under storm conditions, keep students well away from the water itself. Ask the children:

- How high are the waves?
- Do you see anything floating in the water?
- Which way is the wind blowing?
- How is today different from your last trip to the beach?
- Do you like it better? Why?

Additional Activities:

1. Art: Try to capture the force of the storm with finger painting.
2. Language Arts: Write a class story or poem on the chalkboard about a beach-storm and its wind, waves, sand and rocks. Then act it out.

Activity 5
Travel



Vocabulary:

- ferry
- kayak
- canoe
- skiff
- raft
- umiak
- barge
- tanker
- port
- starboard
- bow
- stern

Materials:

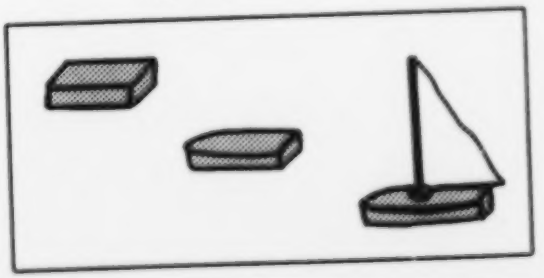
- globe or wall map
- driftwood, sticks, wood scraps, and toy boats
- large basin of water
- paper
- scissors
- string
- knives (for adults)
- glue

Procedure:

1. Help children understand the importance of ocean travel by discussing some of the following ideas:

   Early people living in Alaska traveled by boat. Why? (It was easier and faster than walking. Have you ever tried walking with a pack through thick bushes?) Would you rather carry a load or put it in a boat? What kinds of boats might early Alaskans have used? (Examples: canoes, rafts, kayaks, umiaks.)

   What kinds of boats do we use in Alaska today for travel? (Examples: ferries, barges, canoes, skiffs, fishing boats, kayaks, umiaks.) Can you name any of the state ferries or riverboats?



2. Make some boats out of wood, bark, paper with the help of parents or older students. Test them in the basin. Simulate waves and wind. Compare the way sticks and driftwood move through the water. Load the boats with "food, fuel and supplies" for the trip to Alaska.

3. Write a class story about the trip over water to your community. Use the globe or wall map to show the children the routes the boats would

travel. Maybe the next time the children go to a beach, pond or river, they can launch their boats!

4. Learn some nautical terms: port, starboard, bow, stern. Play a version of "Simon says" using the terms.

Additional Activities:

1. Social Studies: Arrange for the class to go aboard one of the state ferries, riverboats or barges when they are docked in your community. Ask someone to show your students around the ship. Work with them ahead of time if possible so students can be prepared and looking for the wheelhouse, engine room, cooking and passenger areas.

2. Language Arts: Do a language experience chart on your trip to the ferry: what you saw, what you did and how you felt.

3. Art: Have children draw or paint a picture of a way of their favorite kind of ocean travel or create a class mural on ocean voyages.

4. Collect boating magazines and have the children cut out pictures of the different boats. Then discuss their present and past uses.

5. Music: Learn the song, "Barges," or other sea songs.

Activity 6
Lifestyles

Vocabulary:

- fisherman
- scientist
- diver
- crew
- harbor master
- Coast Guard Officer
- sailor
- marine supplier

Materials:

- pictures of people who make a living from the sea
- construction paper
- felt tip markers

Procedure:

1. With the help of the class, make a list on differently colored word cards of kinds of people who make a living from the sea: fishermen and women, scientists, divers, sailors, harbor masters, crew members - even grocery store owners in fishing towns.

2. Talk about what each of these kinds of people do. Talk about any who are represented specifically in your

community. Encourage children to talk about their parents or people they know whose jobs are tied to the sea.

3. Make a bulletin board with all the pictures and word cards for the different jobs. Have the children draw their own pictures, or use pictures from magazines or Polaroid photos.

Additional Activities:

1. Social Studies: Invite one of these people to come to your class and show some of their gear, clothes, and equipment. Have them tell the children about some of their adventures. Have the children pretend that they have an ocean-related job (such as your speaker's). What would they do each day?

2. Social Studies, Science: Take a field trip to:

   - a fishing vessel to see the gear and the fish hold, to learn how the fishing is done and what it is like to be a fisherman.
   - a state or federal laboratory facility to find out what kind of research is conducted in relation to the sea.
   - a state ferry to find out how the crew members live, when they work, and what their jobs are.
   - a marine supply store to discover what is sold and how the items are used.
   - a marina or a boat harbor to talk to the owner or the harbor master about the problems of taking care of so many boats.

3. Art, Language Arts: Make a mural or individual books based on what the class has learned about lives that are related to the sea. Make pictures of such activities as people fishing or a ferryboat loading.

Activity 7
Food

Vocabulary:

- seafood

Materials:

- foods from the sea
- community and parent assistance

Dear Parents:
We will be having a seafood potluck April 25th from 12-1 p.m. Please come and bring a seafood dish for students to try.

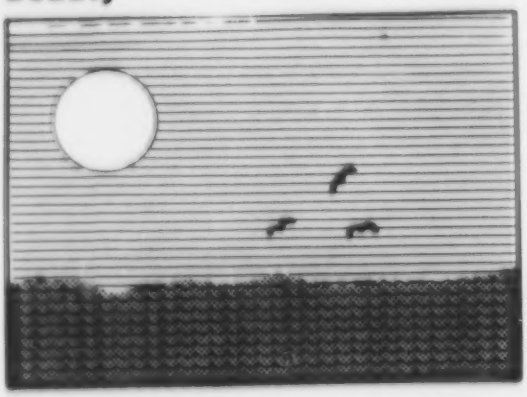
Procedure:

1. Arrange to have an assortment of foods from the sea brought to school for the children to taste. Involve students in the preparation, perhaps even in the gathering, of the food. Encourage community members to share their knowledge with your class. Perhaps the tasting party could be an event to which parents are invited. Try to provide a variety fish, clams, crab, shrimp, mussels, and seaweed, and encourage the children to sample everything.

[NOTE: Paralytic shellfish poisoning (PSP) is a dangerous toxin sometimes present in Alaskan shellfish. It is recommended that any shellfish on the menu be purchased at a legitimate seafood outlet or obtained from a certified beach (Check with the Alaska Department of Fish and Game for a list of certified locations.). It's further recommended that you as teacher personally provide the shellfish for the menu, to insure the safety of the source.]

2. If possible, also bring in samples of seafoods purchased in the supermarket such as salmon, halibut, oysters, seaweed crackers. The tasting party could be based entirely upon materials from a store. The important experience is the tasting itself.

Activity 8
Beauty



Materials:

- pictures of beaches and the open sea
- poems about the ocean

Procedure:

1. At the beach, help children experience the beauty of the sea. During your visit, have them close their eyes and listen for the sounds of water, birds and wind. Have them smell the sea and feel the breeze. Have them sit quietly and observe and think about what they see. Perhaps later, in the classroom, you will want them to try to put their experiences into words or pictures.

2. Show beach and ocean pictures to the class. Write three descriptive words under each picture to tell how the class feels about the scenes.

3. Share one or more of the following poems with the children. Have the children dictate their own sea stories about the beauty of the sea and then illustrate them.

Until I Saw The Sea

Until I saw the sea
I did not know
that wind
could wrinkle water so.

I never knew
that sun
could splinter a whole sea of blue.

Nor did I know before,
a sea breathes in and out
upon a shore.

- Lilian Moore

An Ocean Lullaby

Our ship is a cradle on ocean's blue pillow;
Rest, little spirit, your head on your pillow!
Dream of the dolphin that leaps from the water,
Dream of the flying-fish, dear little daughter;
Dream of the tropic-bird lone in his flight, -
Where is he sleeping, I wonder, tonight?
Dark is the water with white crests of foam;
Sleep, little mermaid, the sea is your home!

Stars in the heavens are twinkling past number;
Waters are whispering slumber, love, slumber;
Waves are a-murmuring sleep, dearest, sleep!
And the little one slumbers in peace on the deep.
Sing away wavelets and sigh away low,
Winds of the tropics about us may blow;
Baby is sleeping and mother is singing
And the peace of the evening about us is winging.
Sleep, little mermaid, as onward we roam,
The ship is your cradle, the sea is your home.

- Charles Keeler

Ocean Bibliography

Children's Literature:

Carter, Katherine. True Book of Oceans. Illustrated by Mary Gehr. Children's Press, Chicago, 1958. 47 p.

A book for beginning readers about what the ocean is, what's in it and how it affects us. Includes such topics as the ocean floor, surface, shore, tides, currents, ocean plants, animals, and ways the ocean helps humankind. Indicates vocabulary words in capital letters.

Cartwright, Sally. Sand. McCann and Geohegan, Inc., New York, 1975. 31 p.

Explains what sand is, and how it can be used. Attractive illustrations.

Cecil, George. Salt. Franklin Watts, New York, 1976. 48 p.

Discusses salt, its sources and uses. Illustrated by photos and drawings.

Eldridge, David. Sea Monsters. Mahwak, N.J., 1980. 32 p.

Describes prehistoric animals of the sea. Color illustrations.

Goldin, Augusta. The Bottom of the Sea. Illustrated by Ed Emberley. Thomas Y. Crowell Company, New York, 1966. 33 p.

Introduces the geography of the underwater world with its cliffs, canyons, mountain ranges and coral reefs in clear language with vocabulary words in capital print.

Gramatky, Hardie. Little Toot. G.P. Putnam's Sons, N.Y., 1939.

Children's classic story of the work of a tug boat.

Haas, Irene. The Maggie B. Atheneum, N.Y., 1975.

A little girl's wish to sail for a day on a boat named for her "with someone nice for company" comes true.

Knight, David C. Let's Find Out About the Ocean. Franklin Watts, Inc., N.Y., 1970. 55 p.

Overviews many aspects of the ocean including living things, transportation. A good book to share or read slowly with children.

Schroder, William. Pea Soup and Sea Serpents. Lothrop, Lee and Shepard Co., N.Y., 1977.

Two young boys set off to hunt for sea serpents but are foiled by thick fog.

Schultz, Charles M. Snoopy's Facts and Fun Book About Boats. Random House, N.Y., 1979.

Schultz's characters in a fun little book about different kinds of boats.

Swayne, Dick. I Am a Fisherman. J.B. Lippincott Co., N.Y., 1978.

Simple text and photographs following a young boy to sea.

Swift, Hildegarde H. The Little Red Lighthouse. Harcourt Brace & World, Inc., New York, 1942. 45 p.

This delightful tale explores the relationships between boats, ships, darkness, storms, and lighthouses.

Walcott, Patty. Tunafish Sandwiches. Illustrated by Hans Zander. Addison-Wesley, Reading, Mass., 1975. 24 p.

Using only 10 words, this book conveys the idea of the food chain in the ocean with man the ultimate user. Attractive color illustration. Highly recommended.

Williams, Brian. Under the Sea. Warwick Press, N.Y., 1979. 23 p.

Colorful pictures with simple language about life under the sea.

Teacher's Reference:

Campbell, A. C. The Wonderful World of Life in the Sea. The Hamlyn Publishing Group, Ltd., New York, 1976. 96 p.

Large picture format coverage of seashore animals and plants, shallow seas, coral reefs, open seas, deep seas. Many color photographs.

Unit Two
Wetlands

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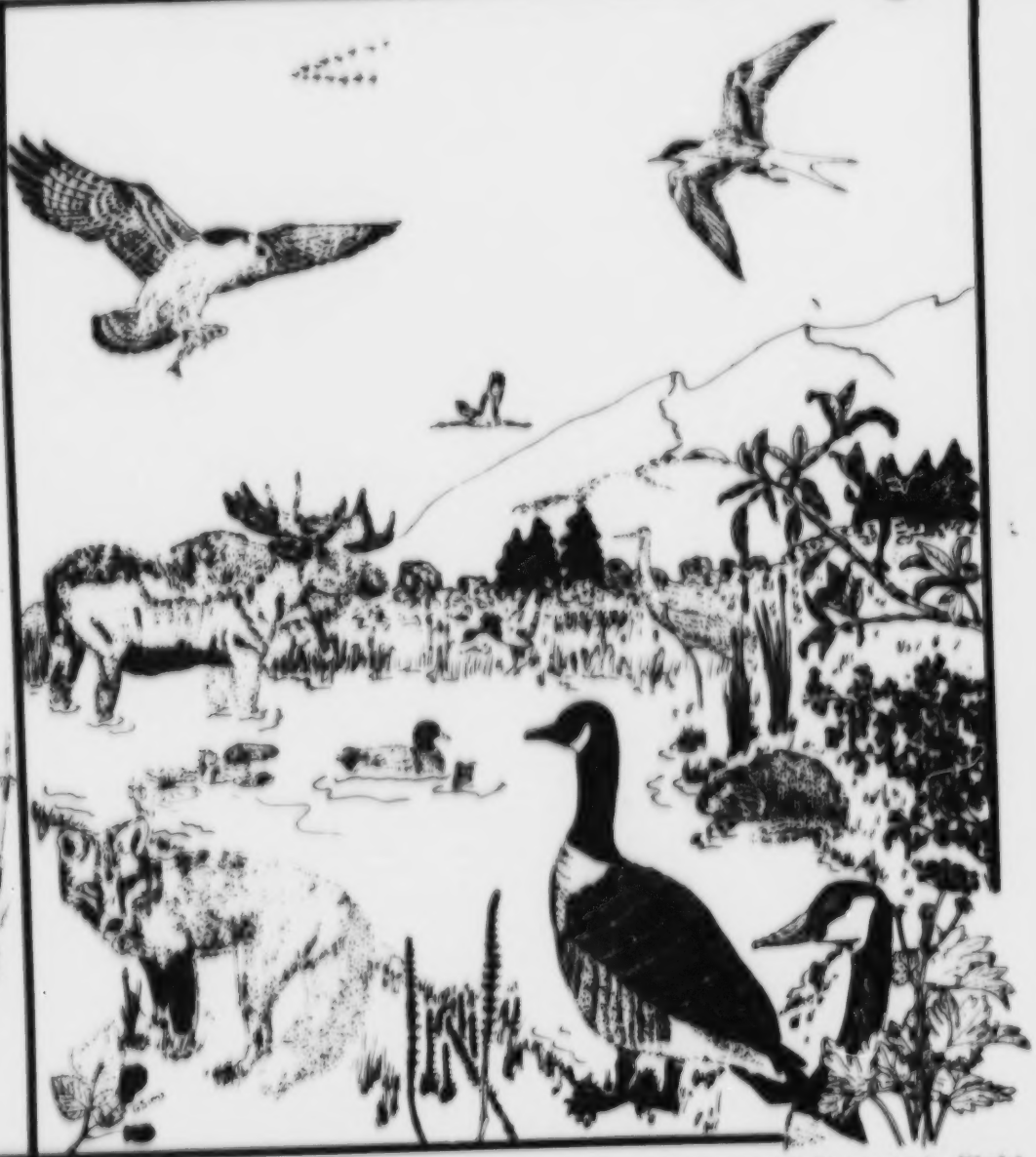
Objectives:

To help students:

- Understand that wetlands are homes for young fish, birds and other animals (Activities 1 and 2).
- Realize by squeezing wetland soil or sphagnum moss that wetlands hold a lot of water (Activities 1 and 2).
- Look for signs of wetland animals (Activity 2).
- Experience and appreciate a wetland (Activity 2).
- Touch wetland plants (Activity 2).
- Learn that some wetland plants are poisonous (Activity 2).
- Count wetland birds and fish (Activity 2).
- Listen to wetland sounds (Activities 2 and 3).
- Watch wetland insects (Activities 2 and 3).
- Make a freshwater aquarium for the classroom (Activity 3).
- Finger paint wetland beauty (Activity 3).
- Listen to wetland legends (Activity 3).
- Write a class story about local wetlands (Activity 3).
- Think about ways to help protect local wetlands and their plants and animals (Activity 3).

Tundra wetlands. Clockwise, from upper left: caribou, Sabine's gull, Canada geese, oldsquaw male and female, water sedge, arctic fox (summer phase), saxifrage, snowy owl, cattails.



Marsh wetlands. Clockwise, from upper left: osprey, sandhill crane in flight, arctic tern in flight, willow, sandhill crane wading, beaver, wild celery, Canada geese on shore, mares' tails (plant), mallard ducks afloat, red fox, salmonberry, water lilies, bull moose.

Activity 1
Wetland Homes

Background:

Wetlands are places where the ground is soggy at least part of the year. Wetland plants and animals have adapted to soil that is saturated with water. Here in Alaska, just about the whole state consists of wetlands - with the exceptions of mountains and glaciers. Wetland areas include fresh and saltwater marshes, estuaries (where rivers meet the sea), tidelands, muskeg, bogs, tundra, and swamps. Wetlands play important roles in the water systems that flow to the sea. They are critical for fish and wildlife survival, and they provide recreation as well as water and food for humankind. Wetlands act as natural storm buffers and help prevent flooding by soaking up heavy rains. Wetlands also filter out pollution, and are abundant sources of such edibles as fish, birds, crabs, shrimp, clams, moose, caribou, and berries and other plants.

Wetlands often are more productive than the best agricultural areas. In Alaska, wetlands produce incredible numbers of moose, caribou, birds and fish. Decaying vegetation from the wetlands contributes nutrients to the water, which eventually finds its way to sloughs or streams. These nutrients are used by algae and tiny floating plants and animals (plankton) which in turn are eaten by insects and fish - and eventually by bigger fish, birds and mammals. The entire Alaskan salmon industry depends on the preservation of streams and surrounding wetlands where salmon breed!

Vocabulary:

- wetland
- plant
- soil
- animal
- sun
- water
- air

Materials:

- wet sphagnum moss or other spongy, damp, wetland plant
- crayons
- worksheets:
  ...Wetland Marsh (2-A)
  ...Wetland Tundra (2-B)

Procedure:

1. Bring to class some wet sphagnum moss or substitute for the children to touch and squeeze. (Almost any undeveloped low-lying land will have ample supply. Moss can be dried and kept from year to year; just soak it before use. Peat moss from some of your potted plants will do in a pinch if the ground outside is too frozen for collections. Explain that the moss or mud

is from a wetland. Mention nearby examples, noting that many birds, fish and animals like wetlands for their homes.

2. Tell the children that you would like them to tell you about wetlands. Pass out the Wetland Marsh or Wetland Tundra worksheets, noting that many of the worksheet animals are found in both habitats. Ask the children:

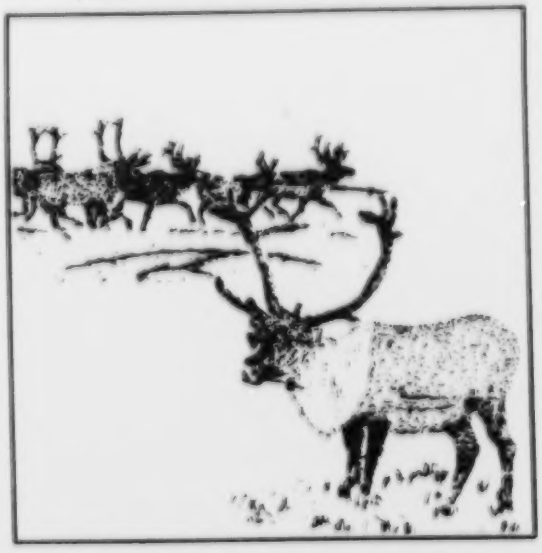
   - What animals do you see?
   - What plants do you see?
   - What do the plants need to grow? (Soil, sun, water, air.)
   - What do the animals need to grow? (Soil, sun, water, food, air.)

   Have the children color the worksheets.

3. Turn your classroom into a wetland. You'll need imaginary water, soil, plants, animals and sun. Roleplay the different plants and animals in their wetland homes. Clear away desks and chairs so the children can imitate the animals growing, eating, drinking and hiding.

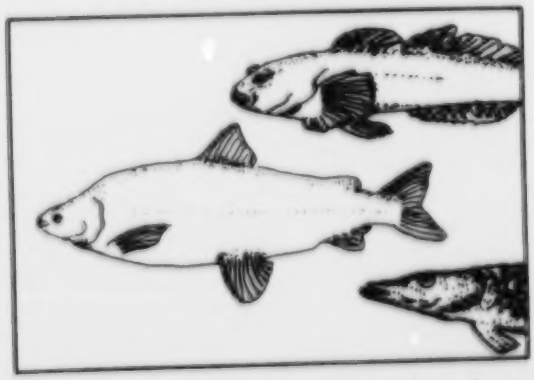
Here are some tips to weave into your fantasy:

- Moose have long legs for striding through water, and for escaping from bears, wolves and people. Moose eat pondweeds and willow bushes.



- Caribou also have long legs for stepping through the watery tundra and for escaping from predators. Caribou eat lichens and plants.

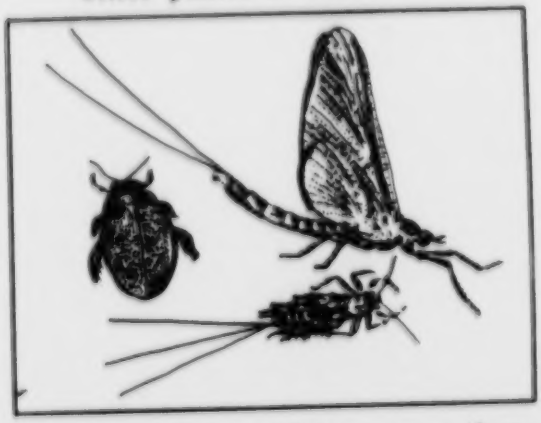
- Geese eat grasses and bugs. They nest among grasses or on little islands to hide from foxes, people and gulls (which eat their eggs).



- Fish swim in the abundant water. They eat bugs and other fish. When they're young, they hide among pondweeds.

- Snails eat plants and leftovers from the meals of other animals. They hide by moving so slowly that they are hardly noticeable.

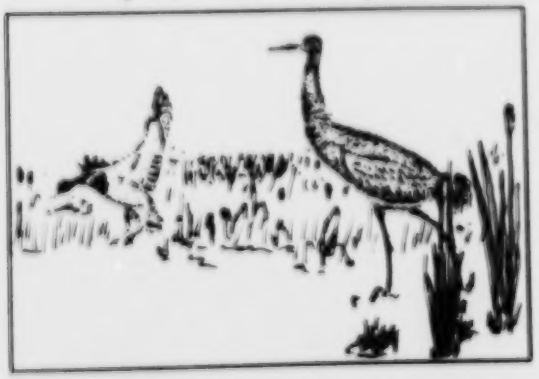
- Grasses grow with the help of the sun. Grasses have four parts: roots, stems, leaves and flowers. Grasses make their own food, and serve as food for many animals. At first thought it doesn't seem that grasses move; but often when we look at wetlands, the only movement we see is the swaying of the grasses and other plants in the breeze.



- Insects eat plants, or other insects, or decaying fish and other animals. Most insects are fast-moving - whether they live in the water or in the air - so they can escape from the many animals that like to eat them.

• Pondweed makes its own food under water with the help of the sun. It is eaten by many animals. Pondweed has flexible stems and leaves that sway with the water currents.

• Ducks eat pondweed and insects. They rest in grasses or on little islands, where they can hide from predators.



• Sandhill Cranes are long-legged so they can wade through water and tall grasses as they hunt for plants, insects, fish, voles, and even snowshoe hares. Sandhill cranes escape from enemies by running or flying.

• Red Foxes run swiftly through the grasses to catch voles, mice, lemmings and snowshoe hares. Those animals aren't their only foods, though. Foxes also like bird eggs, insects, and even berries.

• Snowy Owls perch on the little wetland islands called hummocks, watching for the voles, mice and lemmings that they like to eat.

• Gulls nest in grasses, from which they flap into the sky, screaming loudly, when their nests are approached by

people, foxes or other predators. Gulls eat fish, snails, decaying animals, bird eggs and insects.

- Frogs eat insects, and sometimes are eaten by cranes and other birds and animals. Frogs try to escape their enemies by hopping or by swimming. Frogs have smooth skin and spend most of their lives in the water.

- Toads look a lot like frogs, and like frogs they eat insects. But toads have bumpy skin that tastes terrible to other animals, so they are seldom eaten themselves. Most toads can't hop as far as frogs; and unlike frogs, the toads spend most of their lives on land.

For a finale, have small groups of students imitate all the animals in their wetland home at once!

Activity 2
Experiencing a Wetland

Background:

Wetlands are among the most fun places for children to explore because they have an abundance of childhood favorites: water and animals. Experiencing a wetland firsthand is an excellent opportunity for students to learn through touching, listening, smelling, seeing and tasting.

Materials:

- plastic bags for litter
- kitchen strainers
- buckets
- field trip task cards
- wetland marsh checklist
- wetland tundra checklist
- pencils

Procedure:

1. Select a local wetland for a field trip. Try a slough, pond or bog near your school if one is available, or go to a nearby marsh. If a wetland is within walking distance, try consider planning several

short trips rather than one long one.

2. Involve parents, your school's bilingual staff, and other community resource people in planning and leading your field trip.

3. Prepare your students ahead of time. You might want to go over some of the activities in this volume's bird unit to familiarize yourself with wetland birds before going into the field. It also he'ps to work with student observation skills: Bring a live animal or plant into class and let them practice: How many parts does the plant have? What does the plant or animal feel like? Smell like? What else can they tell you about it?

4. Ask the children to make up some rules about protecting their plant and animal friends in the wetlands. How can they keep from disturbing wetland homes? Remind the children that they're much bigger than most wetland plants and animals, and that they need to be gentle and step softly. You might also want to use the litterbug activity in the seashore unit.

5. Review safety with the children. Here are a few suggestions:

- Stay together. Have a buddy. If you become lost, stay right where you are and call out periodically.
- Dress warmly and keep dry.
- Stay a safe distance from the water. In wetlands, because the ground is so mushy, sometimes you can get stuck. So step carefully.
- Don't taste anything without adult supervision. The wetlands contain many poisonous plants, and some people are allergic to plants that normally are harmless.
- Carry a first aid kit.

6. Develop an outline for the field trip. For your first trip, you might want to spend the entire time simply discovering rather than in organized activities. Eventually, though, you'll want to plan some structured activities, games, snacktimes, litter pickup, and a review of the day's events. This unit's task cards can be used for group activities or can be given to volunteer leaders for small group exploration. The checklist can be used by each child or each group leader. Limit collecting activity to minimize your class's impact on the wetlands.

- You might want to collect materials for specific art projects, or a bucketful of pond water along with pondweeds and aquatic insects with which to make a classroom aquarium. Most fish require a constant oxygen supply; so arrange for an aquarium pump, aerator and filter if you plan to keep fish.

Enjoy the field trip with your students. It should be one of the highlights of your school years!

Field Trip Task Cards

Spaghnum Moss

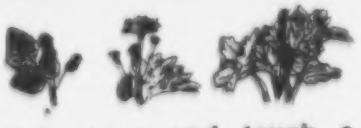
Leader:

- Find some spaghnum moss (or any spongy and damp plant growth) and have the children squeeze it as they did earlier in the classroom.

Ask the children:

- How much water is in this wetland? (Lots!)
- What happens if it's sunny for a long time? (The wetland will slowly put its water into nearby streams so they won't be so dry.)
- What happens if it rains for a long time? (The wetland will soak up water--so nearby towns won't flood.)
- What life needs water in the wetlands? (Plants, fish, water insects, birds, mammals.)

Wetland Plants



Leader:

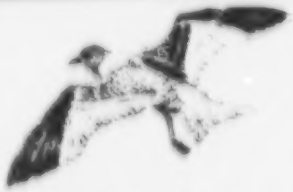
- Have everybody reach down and touch a different plant (don't pick it).
- Describe it to your group. How could it be found again?

Color _____	
Height _____	(as tall as my knee, over my head)
Feel _____	(smooth, sticky)
Leaf size _____	(big, small, tiny)
Flower _____	(color, shape: looks like a _____)
Location _____	(in or near water, on a little hummock)

Tell the children:

- Look at it one more time. Close your eyes. Let someone spin you around. Walk 10 feet away. Now open your eyes and try and find your plant!
- Try this again with pondweeds.
- Pretend you're a water plant. Put on a pond dance--first in the wind, then the rain, snow and sunshine.

Wetland Birds



Leader: Ask the children:

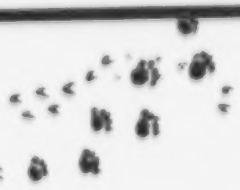
- What birds do you see?
- What are they doing?
- Why do you think birds like it here?
- Count how many birds you can see.
- Where would you hide if you were a bird and heard a fox sneaking up?
- Pretend you are a bird living on this wetland. Show your friends how you would act--and see if they can guess what kind of bird you are!

Wetland Sounds

Leader: Say to the children:

- Close your eyes and listen.
- What do you hear? Imitate the sounds.
- Try listening again for a little longer.
- What did you hear this time?
- Try to remember these sounds so we can have a wetlands concert when we get back to school.

Wetland Animals



Leader: Say to the children:

- What animals live here?
- What signs do animals leave (tracks, dens, droppings, gnawed twigs)?
- Check muddy places (like the edge of a pond) for signs.
- Who came down to drink most recently?
- Walk through the mud yourself and see what tracks you leave. Can you tell your tracks from those of your friends?
- Close your eyes. Have one person make tracks for a few minutes. Then open your eyes and see if you can tell where they went!
- If you find animal tracks--follow them!

Poisonous Plants

Leader:

Look for poison water hemlock, a wetland plant commonly found in Alaska. Explain that if a child ate even one bit, it would be fatal. Slip open the root so the children can see the chambers inside and sniff the plant's acrid smell. Tell them that there are many other poisonous plants, including some berries and mushrooms. If a child is lost and hungry, it would be better to eat insects rather than plants. All those insects, including mosquitoes, are edible!

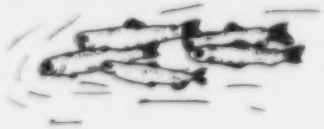
Wetland Insects

Leader: Look for insects with children. Carefully look under plant leaves, driftwood and rocks, remembering to put everything back where you found it. Let the insects crawl on the children's hands.

Have the children count the insect legs. There should be six. See if they can see the tiny head with eyes and antennae, the body (thorax), the stomach (abdomen) and the wings. Release the insects and see where they hide.

Use kitchen strainers to catch water insects. Put them in a plastic bag full of water so the children can watch them swim. Have them count the legs again. Release the insects, explaining that they provide food for many animals. Birds and fish eat hundreds every day!

Wetland Fish



Wetlands are nurseries for many fish species. The shallow water contains many tiny insects and other organisms that are just the right size (baby food) for the fish to eat until they grow larger. If you can spot any small fish in the shallow water, ask the children:

- How many fish are there?
- Where do they hide?
- How do they swim?
- How do they eat?
- What eats them?
- Do you like to eat fish?

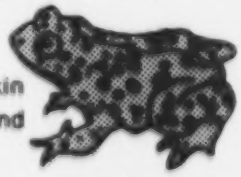
Toads and Frogs

Leader:

- Have the children try to find a toad or frog.

Say to the children:

- Hippity hop--here they come!



Bumpy skin
Spends more time on land

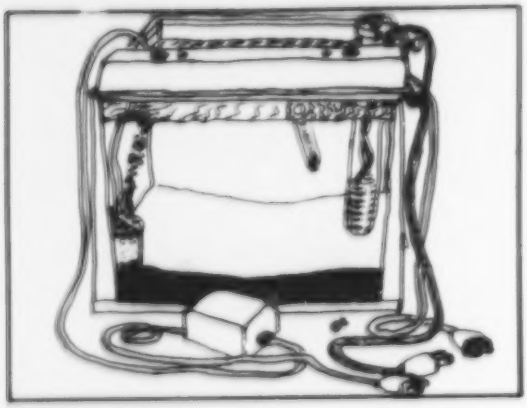
TOAD

Smooth skin
Spends more time in water

FROG

- Hop around like they do! What do they eat? (Insects like mosquitoes!) Zip out your tongue real fast like they do and see if you can catch a bug! (Actually, insects aren't bad to eat--lots of protein.)
- Be a toad or frog in winter. (Curl up in a ball and hide underground to sleep.)
- In the spring, toads and frogs lay their eggs in the water.
- Now it's summer. Pretend you're a tadpole. First feel your tail growing. Now your legs and arms are growing. Soon your tail disappears. Now you're full grown. And ready to hop everywhere!

Activity 3
Remembering the Wetlands



Materials:

- paper
- finger paint
- older resident - storyteller
- aquarium or gallon glass jars

Procedure:

1. Make an aquarium using the animals and plants brought back from the field trip. Give everyone a chance to look closely and tell about what they see. Keep class records of daily changes.

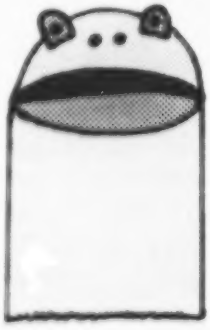
2. Ask students what they remember most about their wetlands trip. Write a class story.

Additional Activities:

1. Art: Finger paint wetlands impressions. Play any records of wetland sounds (birds, frogs, waterfowl or owls calls) as a background.

   Make bookmarks or plant pictures with the pondweeds and wetlands plants. Lay them on heavy paper. Arrange carefully and cover with clear contact paper (or laminate).

Freddie The Frog (green)
or **Tommy The Toad** (brown)



Add bumps on the back for Mr. Toad

2. Art, Drama: Make wetlands puppets! Have the children imitate the animals, and maybe even put on a play! To make the puppets, you'll need glue, construction paper, crayons or tempera paint, scissors and paper bags.

3. Plan a wetlands dinner or snack. Canned salmon can be heated on a hot plate. Include rice - probably one of the most internationally famous wetland plants. (Other possibilities are fish, berries, edible plants, moose, caribou, duck, goose, clam chowder.)

4. Oral History: Invite an older resident familiar with your wetlands to come and tell the children stories and legends.

5. Language Arts: Read wetlands stories to the children.

6. Discussion: What will happen to your wetland in the future? What plans does your village, town, state or federal government have for the area? Discuss the good and bad parts of development. Is there anything your class can do to help protect wetland animals and plants? (One class we know of got their city to put up a sign on a nearby road.)

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Children's Literature:

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Chenery, Janet. The Toad Hunt. Harper and Row, New York, 1967. 64 p.

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Amos, W. H. The Life of the Pond. McGraw-Hill Book Company, New York, 1967.

Stresses ecological relationships with many color photos and fine line drawings. One of the Our Living World of Nature series developed in cooperation with The World Book Encyclopedia.

Burt, W. H. A Field Guide to the Mammals. Houghton Mifflin Co., Boston, 1964. 284 p. (Available in paperback.)

Excellent descriptions, pictures, and range maps of mammal species found north of Mexico. One of the Peterson Field Guide Series.

Furlong, M. and V. Edible? Incredible! Pondlife. Naturegraph Publishers, Inc., Happy Camp, California.

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Horwitz, E. L. Our Nations Wetlands. An Interagency Task Force Report, 1978. 70 p. Paperback. Available from the Superintendent of Documents. U.S. Government Printing Office, Washington, D.C. 20402-Stock No. 041-011-0045-9.

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Hulten, Eric. Flora of Alaska and Neighboring Territories. Standford University Press, Stanford, California, 1968. 1008 p.

Technical descriptions of Alaskan plants. Fine line drawings and range maps make usable by non-scientists.

Iker, S. Look What We've Done to Our Wetlands. National Wildlife, June-July, 1982. Vol. 20, 4 p 42-50.

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Klots, E. B. A New Field Book of Freshwater Life. G.P. Putnam and Sons, 1966.

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Morrow, James E. Freshwater Fishes of Alaska. Illustrated by Marion J. Dalen. Alaska Northwest Publishing, Anchorage, 1980. 248 p.

Detailed descriptions of Alaskan freshwater fish. Line drawings. Also available is a shorter version by the same author: Illustrated Keys to the Fresh-water Fishes of Alaska (78 p.). Same publisher.

Murie, Olaus J. A Field Guide to Animal Tracks. Houghton Mifflin Co., Boston, 1975. 375 p. Also available.

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Niering, W. A. The Life of the Marsh. McGraw-Hill Book Company, 1966. 232 p.

Stresses ecological relationships. Color photos and fine line drawings. One of the Our Living World of Nature Series developed in cooperation with The World Book Encyclopedia.

Reid, G. K. Pondlife. Golden Press, New York, 1967. 60 p.

The best simplified guide to life in and around ponds. Packed with color drawings. One of the Golden Nature Guide series.

Teal, J. and M. Life and Death of the Salt Marsh. Ballentine Books, New York. 274 p. Paperback or hard cover.

Tells the past and present of east coast marshes in a novel-like style. Good background on the importance of wetlands.

Records:

A Day in Algonquin Park. Produced by William H. Gunn. Houghton Mifflin Company, Boston.

Voices of the forest, marsh, and lake through a summer's day from dawn to dusk in Algonquin Provincial Park, Ontario, Canada.

Voices of the Night. The Calls of 34 Frogs and Toads of the United States of America. Produced by Peter Paul Kellogg and Arthur A. Allen. Hougton Mifflin Company, Boston.

One croak after another.

Unit Three
Marine Mammals

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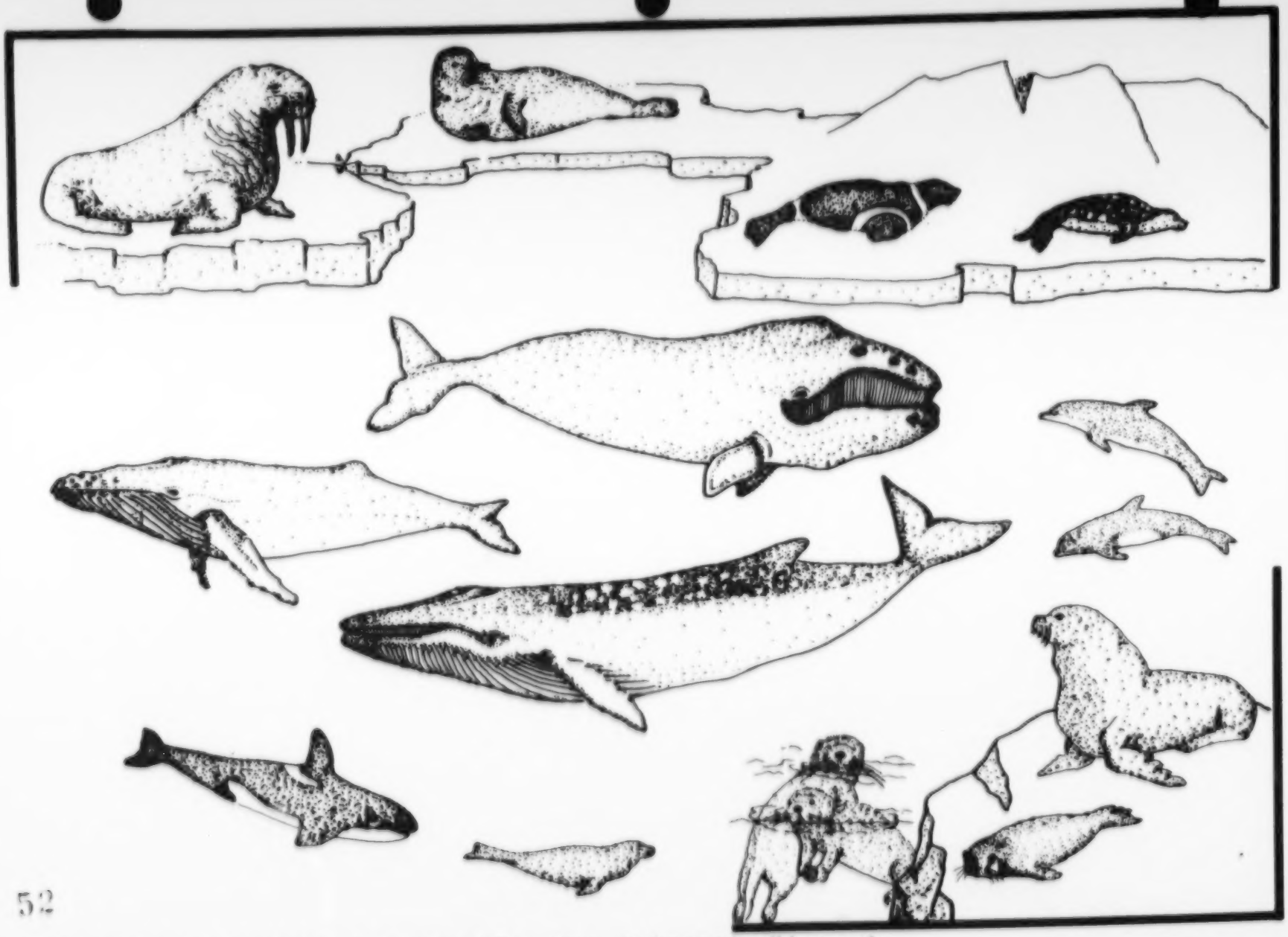
Objectives:

To enable students to:

- Orally identify and appreciate some Alaskan marine mammals (Activities 1-4).
- Make a whale mobile (Activity 1).
- Compare whales to humans (Activity 1).
- Hear the voices of the whales (Activity 1).
- Draw a life sized humpback whale on the school grounds or at the beach (Activity 2).
- Make flippers and masks and participate in a sea lion/seal play (Activity 3).
- Listen to sea otter, seal and sea lion poems (Activities 3 and 4).
- Role play a sea otter eating clams, crabs and fish (Activity 4).



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Marine mammals. Clockwise, from upper left: walrus, harbor seal, ribbon seal, ringed seal, harbor porpoise, dall porpoise, fur seal and pup, sea otter, sea lion, killer whale, blue whale (lower center), humpback whale (left), bowhead whale.

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Marine mammals are an important part of Alaska's ocean environment. Whales, porpoises, walruses, and seals all live in Alaskan waters. Children usually are more attracted to the marine mammals than to any other sea creatures. Most Alaskan youngsters have seen at least a few of them; and the eyes of those who haven't are guaranteed to light up at the opportunity.

Like such land dwellers as horses, cows, deer, dogs, cats, and man, these marine animals all share the distinctive characteristics of mammals. They are warm-blooded, breathe air (coming to the surface), have true hair at some stage in life, give birth to live young, and suckle young with milk the mother produces.

Activity 1
Whales

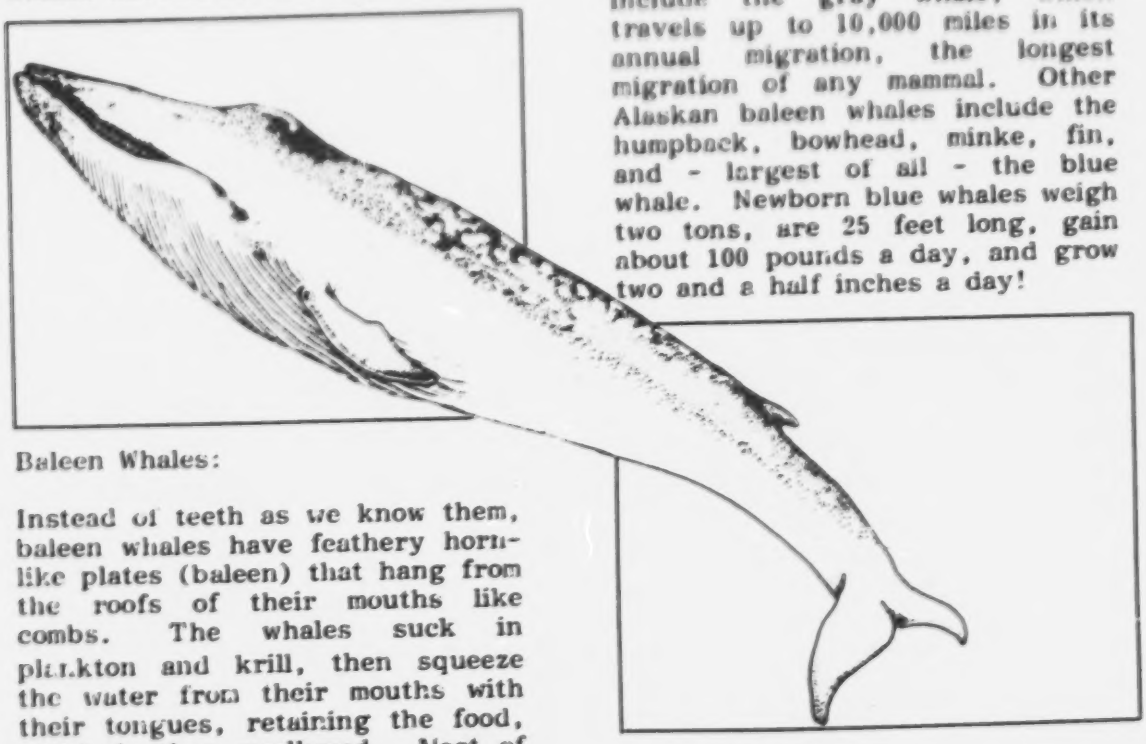
Background:

Whales are the largest animals in the world. Their sleek, streamlined shape helps them to move easily through water. They have lost almost all body hair--something which further helps reduce water friction. Instead of having legs, whales have one pair of paddle-shaped flippers, or forelimbs, that are used for maneuvering in water. The powerful tail is broadened into two fleshy extensions called flukes which the whale flexes up and down to propel itself forward.

To breathe, a whale must rise to the water surface. Its nose, called a blow-hole, is not on the front of its snout but rather is on the top of the head so the whale can breathe whenever it breaks the surface.

Whales have some amazing qualities. They are intelligent and social animals. They court, fight, and defend and train their young. They have a keen sense of hearing and can make sounds with which they communicate, often over distances of many miles.

There are two major types of whales - baleen whales and toothed whales. Baleen whales have no teeth in the usual sense. Thus they can feed only on food that they can swallow whole. Toothed whales do have teeth and thus are hunters that can consume larger prey. Baleen whales have a two-hole blow-hole, while toothed whales have a one-hole blow-hole.



Baleen Whales:

Instead of teeth as we know them, baleen whales have feathery horn-like plates (baleen) that hang from the roofs of their mouths like combs. The whales suck in plankton and krill, then squeeze the water from their mouths with their tongues, retaining the food, which is then swallowed. Most of their food is found near the surface. A usual dive lasts from 10 to 15 minutes.

Baleen whales roam the oceans, some species migrating from polar regions to the equator in regular patterns. They feed in northern waters during the summer when food is abundant there, and also wean their young at that time. Then they migrate to warm waters, where they mate or give birth. There is little food in the warmer regions, but the calves don't need it because they are nursing, and the adults have stored fat--or blubber--from the previous summer.

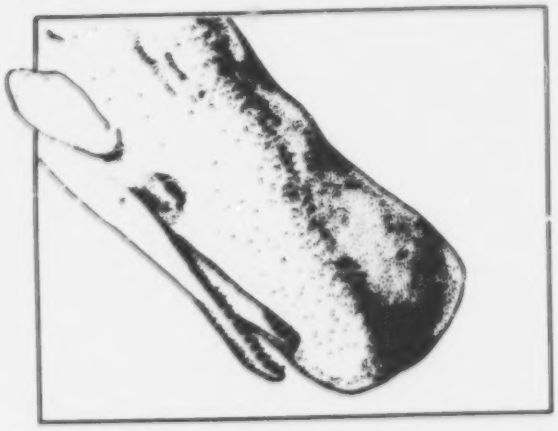
Calves nurse underwater, but they do not suckle; rather, the mothers squirt milk down the calves' throats.

Common Alaskan baleen whales include the gray whale, which travels up to 10,000 miles in its annual migration, the longest migration of any mammal. Other Alaskan baleen whales include the humpback, bowhead, minke, fin, and - largest of all - the blue whale. Newborn blue whales weigh two tons, are 25 feet long, gain about 100 pounds a day, and grow two and a half inches a day!

Toothed Whales:

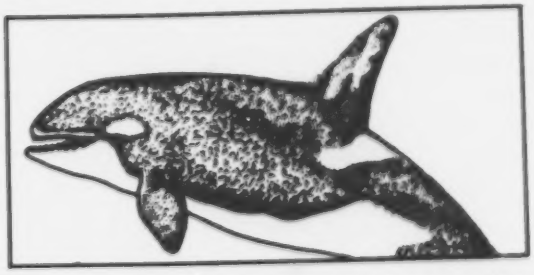
The only huge member of the toothed whale group is the sperm whale. It has teeth in its lower jaw only. While it is a toothed whale, it is in a family by itself, and is sometimes considered separately. Sperm whales have huge, box-like heads, with narrow lower jaws that can open downward to 90 degrees. Sperm whales dive deeper than any other whale. They can stay down one and one-half hours. Squid is their

major source of food. The beluga, narwhal, and beaked whales are other, smaller, Alaskan toothed whales

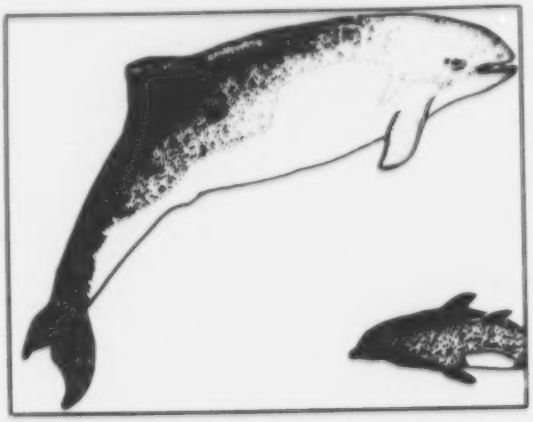


Dolphins and porpoises are toothed whales (cetaceans), too. Porpoises and dolphins travel in schools. They travel up to 20 miles per hour or more, eat fish, are playful, "talkative," and very intelligent. Their brains are larger for their body size than human brains are, and have more convolutions.

Dolphins' hearing is second only to that of bats. Dolphins seem to have awareness of individuality. They will help each other, for instance, by such acts as supporting an injured member of their group on the surface to prevent its drowning. Young dolphins are "parented;" calves are nursed for about one year.



Killer whales are members of the dolphin family also. Killer whales eat fish, seals and birds, and even will attack larger whales. They travel in packs. Males may be 30 feet long and weigh eight tons.



The harbor and Dall's porpoises are commonly seen in Alaska. The Dall's porpoise travels in groups, playfully diving and jumping in motions that create a characteristic roostertail. Dall porpoises are black with white markings. They often swim in the bow-wake of boats. The harbor porpoise is solid black. It is more solitary than the dall porpoise, and often is seen closer to shore, its fin barely out of the water.

Vocabulary:

- whale
- toothed
- porpoise
- baleen
- fluke
- fin
- blowhole
- blubber

Materials:

- Alaskan whale cutouts
- paper bag
- lamination machine or clear contact paper
- driftwood (or sticks or wire

coat hangers)
- string, yarn or ribbon
- whale record
- worksheet:
  ...Alaskan Whales (3A)

Procedure:

1. Photocopy several copies of the drawings of the Alaskan Whales, then cut out the pictures. Print the name of each whale on the back of one set and laminate those. (Note: worksheet drawings are not to scale. Approximate lengths are: Killer whale 30'; Dall porpoise 6'; Harbor porpoise 6'; Beluga 20'; Narwhal 15' (exclusive of tusk); Minke whale 30'; Blue whale 100'; Bowhead whale 65'; Sperm whale 50'; Gray whale 45'; and Humpback whale 50'.)

2. Put the other cut-up sets of the whole drawings in a paper bag. Have each child pull out one whale, color it, and match their whale with your set. They can then write its name (and their own name) on the back. Laminate their whales and tape them to their desks. The classroom set can be turned into a mobile, along with driftwood, string, yarn or ribbon.

3. Ask the children what they would like to find out about whales. Research the answers. Also encourage each child to find out more about his or her whale. Read some of the teacher background material to your class. Have each "whale" stand up when its name is mentioned.

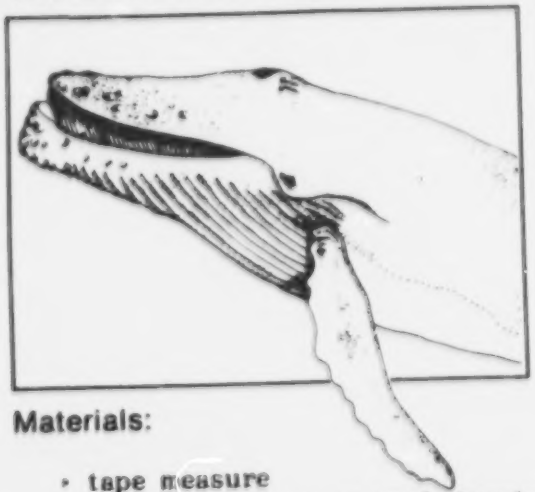
Additional Activities:

1. Art: Draw and cut out the outline of a whale on two large sheets of butcher paper. Staple it together and stuff it with newspaper. Have the children paint it and glue popcorn "barnacles" to its back and sides. Hang your whale from the ceiling.

2. Language arts: Listen to a record of whale sounds (see bibliography). Have the children close their eyes and imagine what it would be like to float in the ocean like a whale. Compare the whales to humans. What if we didn't have toes or fingers? Have the children move their "flippers" and their "flukes." What if our noses were on top of our heads? Have the children breathe through their "blowholes." What if we had to guide ourselves by hearing rather than by sight? What if we had to eat under water? Whales are very smart, too. If a whale came to your school, it would have a lot to teach everyone - both students and teachers. What do you think the whale would say?

3. Science: Take a trip to the beach to look for whales and other marine mammals. If the children see one, it probably will be the highlight of the year. Otherwise, you may need to construct one on the beach. (See next activity.) This might be a good time to talk about why there aren't very many whales and why they are still being chased by large factory ships. Modern whaling can be contrasted with the Eskimo way of hunting.

Activity 2
The Size of a Humpback Whale



Materials:

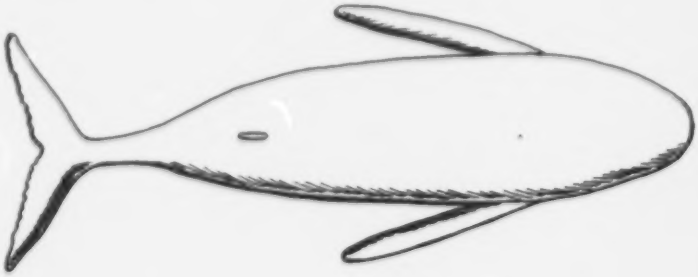
- tape measure
- playground area or unobstructed space at least 50 feet by 20 feet
- stick, chalk, rocks or dry tempera paint for marking lines in the dirt, snow, gravel or pavement
- rake
- worksheet
  ...Humpback and Killer Whales (3B)

Procedure:

1. Choose a sunny day. With the help of the students measure out a distance of 50 feet. Then using the diagram below, measure and mark off the other dimensions with a stick, chalk, dry tempera paint, or even playground rocks.

Length	50' or 12 students
Greatest width	7' or 2 students
Length of forelimb	14' or 4 students
Width of flukes	14-18' or 4 students

While looking at the sample picture, try giving the children an idea of a humpback whale's size. It might help to note that baby humpbacks gain about 10 pounds an hour, or 240 pounds per day! After looking at the picture, have children outline the body, flukes, and fore-limbs of the whale. Perhaps let older students help or do some advance preparation, such as measuring and rough outlining. With the rake, roughen the animal's body so that it stands out better from the surrounding background.



2. Take some student measurements:

   How many students can fit within the fluke outline of the whale?

   Holding hands with arms outstretched, how many children fit from snout to flukes?

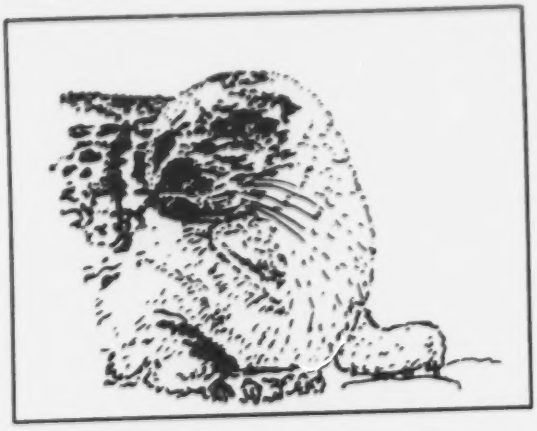
   How many arm lengths long are the flukes?

3. Give your whale a name. Make up a class story about the whale you outlined.

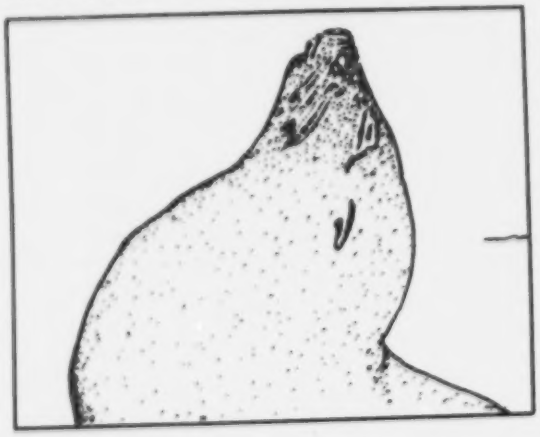
4. Use the Humpback and Killer Whales worksheet as a review of the differences between baleen (the humpback) and toothed (the killer) whales.

Activity 3
Seals, Sea Lions, and Walrus

Seals, sea lions, and walrus belong to the order pinnipedia, meaning "fin-feet."



True seals don't have the external ear structures known as "pinnae" that most mammals have. They appear to have holes in their heads where the internal ear is located. True seals have hind flippers that extend backward. True seals are awkward on land, but more streamlined and well-adapted to deep diving than sea lions. Pups are born singly, not in litters, and they are weaned after about a month. Ringed, ribbon and spotted seals are born with white coats. Bearded seals and harbor seals are not, though all seals have "puppy coats" at birth. True seals will haul themselves up on rocks or beaches, but remain close to the water's edge. Some migrate, others do not. The ringed, ribbon, Oogruk (bearded) and harbor seal are the ones found here in Alaska.



Sea lions have small, external ears, and their flippers are larger--the rear flippers can be rotated forward. One-third of their lives are spent on land. The gray pups are not weaned until about one year! Bull sea lions have harems.

The California sea lion is best known as the circus "trained seal." The Steller, or Great Northern Sea Lion which we have in Alaska is the largest, and is less "tameable." Stellers are near-sighted on land, but have keen eyesight in water. Steller sea lions often surface with their food (fish, squid, octopus) and gulp it down. This allows them to shake large food items apart. There is a high mortality rate (about 50 percent) among pups. Sea lions have escaped commercial exploitation because their hide is not considered desirable.

The walrus is the largest pinniped in arctic and subarctic seas, usually found in relatively shallow water areas, close to ice and land. Both males and females have tusks which are used for fighting and for climbing out on the ice. The walrus feeds primarily on clams and whelks which it sucks up with its mouth after brushing the sea bottom with its broad, flat muzzle. Walrus also eat snails, crabs, shrimp, worms, and occasionally seals.

Currently, all marine mammals are protected under the Marine Mammal Protection Act of 1972. Eskimos and Indians who take marine mammals for food and clothing are exempt. But in general, this act makes it a federal crime to kill, capture, or harass any marine mammal, or retain any part of that animal. Exceptions are made for scientists, aquaria, and commercial fishermen by special permit.

Schools can get permits to salvage hides, skulls or bones. Legally you should leave everything on the beach until you have a permit from the National Marine Fisheries Service (P.O. Box 1668, Juneau, AK, 99811).

Vocabulary:

- seal
- sea lion
- walrus
- flippers
- fur

Materials:

- seal, sea lion or walrus bones and hides, which can be borrowed from the Alaska Department of Fish and Game, the U.S. Fish and Wildlife Service, National Marine Fisheries or from someone in your community
- tan, brown and grey construction paper
- black magic markers
- string
- worksheet
  ...Seal and Sea Lion (3C)
  ...Seal Mask (3D)

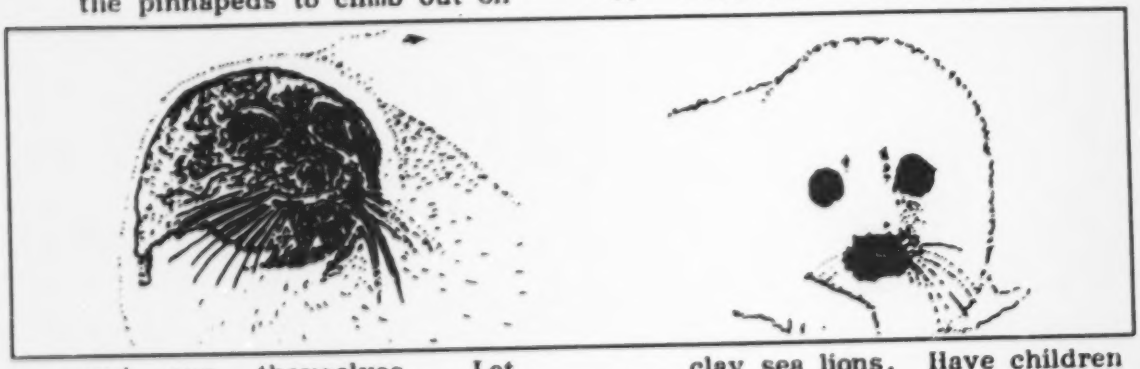
Procedure:

1. Show the students pictures, skulls, hides and bones of seals, walrus or sea lions. Let them touch and feel. Use the worksheet and the artifacts to explain "flippers," "fur," and the differences between "seals" and "sea lions" (Seal flippers angle backward and are smaller than the forward-facing sea lion).

2. Ahead of time cut four flippers and one face per student, using the Seal Mask worksheet. Make the sea lion flippers just a little longer. Punch string holes and tie pieces five inches long in each hole. Use a black magic marker and draw one seal face and one sea lion face as examples. Draw lines in one set of small and one set of

large flippers as indications of where the webbing is.

3. Show the students your sets of flippers and faces. Have them color their own. Then tie them on, the larger sea lion flippers backward and the seal flippers forward. The tying takes a while. You might want to recruit some help. Put on the masks and swim around the room. Make a pile of imaginary rocks in one corner of the room for the pinnapeds to climb out on and sun themselves. Let them talk to one another--"Arf, arf."



4. Make your own class play. What would happen if a humpback whale came along? Would you frolic with it? Pretend that you're a sea lion that suddenly discovers a school of herring. After you've feasted on these, haul out. Generally, you wouldn't find seals and sea lions together. So make a sand, mud, or ice floe "haul out" place on the other side of the room for the seals. Now some gulls fly by. Spread out after you've rested to try to find a fish. What would happen if you saw a walrus? Would you be scared? Here comes a killer whale; swim for your life!

5. Cut out a large tag-board sea lion or seal. Make herring or salmon from construction paper and have children put glitter (silver) on the sides of the fish. Tape a sack to the backside of the seal or sea lion as a receptable into which the students can "feed" their fish to the animal. Count the herring or salmon as they're "eaten." Or make a walrus and count the clams it eats.

6. Construct sweet potato or clay sea lions. Have children bring in potatoes. Pin on raisin eyes. Make pin holes at sides for whiskers and insert broom straws, stiff grass or porcupine quills. Prop the front up with toothpicks. Arrange "herd" on a rock pile and you have a rookery.

7. Share this poem with your students.

Sea Lions

The satin sea lions
Nudge each other
Toward the edge
Of the pool until
They fall like
Soft boulders
Into the water.

-Valerie Worth

Seal Lullaby

Oh! hush thee, my baby,
the night is behind us.
And black are the waters
that sparkle so green.
The moon, o'er the combers,
Look downward to find us
At rest in the hollow
that rustle between
Where billow meets billow
there soft be thy pillow,
Ah, weary wee flipper ling,
curl at thy ease!
The storm shall not wake thee,
nor shark over take thee,
Asleep in the arms of the
slow-swinging seas.

-Rudyard Kipling

Activity 4
Sea Otter

Background:

A sea otter may grow to about three feet long and can weigh as much as 85 pounds. It has a thick, glossy coat with white-tipped hairs that give it a frosted look.

The sea otter comes out of the water to rest on rocky shores, but spends most of its life in the sea, usually in beds of large kelp. There it swims, floats on its back or plays. It dives to the sea floor to find food and then returns to the surface, turns onto its back, and rests in the water while eating. It is a mammal which uses "tools" and may bring a rock up from the sea floor to use to break open an urchin or a clam, holding everything on its chest as if it were a table.

Sea otters once were abundant along Alaskan coasts but were extensively hunted for their fur during the days of Russian influence. Now they are protected, and today again there are many sea otters in the Aleutian Islands, the Gulf of Alaska and Prince William Sound, and they have been re-introduced in other coastal areas of the state.

Sea otters should not be confused with river otters. The latter, which are common in many rivers and coastal areas of Alaska, live primarily in freshwater environments but enter the ocean to feed on fishes and other marine animals. A river otter may be seen swimming along, parallel to shore, diving and showing its long, slender tail, but it never turns on its back and lies in the water feeding the way a sea otter does.

Vocabulary:

- protected
- sea otter

Materials:

- crayons
- construction paper
- glue
- clamshell
- worksheet
  ...Sea Otter (3E)

Procedure:

1. Pass out the Sea Otter worksheet. Discuss with them what a sea otter is. (Discuss the differences between a river and a sea otter if relevant in your community.) Cut out construction paper sea otters. The children can draw the faces and glue on a clamshell.

2. Have the students role-play sea otters. Tell them to lie on their backs, feeding. First they may have to swim down and get a rock to crack their clams or crabs on.

Additional Activities:

1. History, Science: Show the film Warm Coat, which describes the transport of sea otters from the Aleutians to other areas of Alaska in the early 1960s. This operation has been very successful and the otter population is now just about as high as when the Russians arrived to exploit the animals, and almost drove them to extinction. There is good footage of the animals playing and eating. After the viewing, students might want to try role playing the otters again.

2. Share this poem with your students.

Sea Otter Lullaby

Snuggled in kelp,
Anchored deep
Mother and daughter
Sea otter sleep.

Crescent moon
Sinking low
Waves rock you gently
To and fro.

Star-fish below
Your watery bed,
Stars shining brightly
Over your head.

-courtesy of Paul Wallina
and Kay Goines

Otters

Oftentimes, sea otters winter in coastal harbors. If otters are common in your area, take a harbor field trip to see one. You may want to take a spotting scope and some extra adult help. Have students hold hands and stay near the center of the dock. Discuss what should be done if someone falls in. (Yell for help, extend an oar, toss a rope or life ring.) If you see an otter, have the children watch what it does. How many times does it dive? What is the last thing you see as it goes under? This contrasts to a seal, who just sort of sinks under like a submarine. Can you tell what it's eating? Otters need to eat a quarter to one-third of their body weight each day. They have hardly any fat (blubber). Whales have lots of blubber and no fur. Seals and sea lions have some fat and some fur; and otters have no fat and lots of fur. They will die if they don't eat for three days. Contrast that to your students. How much would they have to eat each day?

Marine Mammals Bibliography

Children's Literature:

McDearmon, Kay. A Day in the Life of a Sea Otter. Dodd Mead and Co., New York, 1973. 44 p.

Describes the life of a sea otter and her pup.

McDearmon, Kay. The Walrus: Giant of the Arctic Ice. Dodd Mead and Co., New York, 1974. 45 p.

Follows the life of a female walrus and her calf. Good for sharing with the class.

McGovern, Ann. Little Whale. Illustrated by John Hamberger. Four Winds Press, New York, 1979. 43 p.

Describes the life of a humpback whale from birth to adulthood. Includes a glossary of whale words, a note about the danger of whale extinction. Attractive blue, green, and light brown illustrations.

Phleger, Fred. The Whales Go By. Random House, 1959. 62 p.

An I Can Read, Beginner Book about the life and life history of a grey whale.

Pluckrose, Henry, ed. Whales. Gloucester Press, New York, 1979. 28 p.

Describes whales and dolphins with a simple text and color illustrations.

Shaw, Evelyn. Sea Otters. Illustrated by Cherryl Pape. Harper & Row, 1980. 63 p.

An I Can Read book on how a mother sea otter takes care of her baby pup and teaches him to be independent. Includes eating, sleeping, and protection.

Woodhouse, Kate, ed. The Life of Sea Mammals. Silver Burdett, N.Y., 1979. 61 p.

Facts and color illustrations for sharing with students.

Teacher's Reference:

All these books (except the Alaska Geographic book and Alaska Wildlife Notebook Series), the chart, and records are available from Whale Gifts, Center for Environmental Education, 624 9th Street, N.W., Washington, D.C. 20001.

Alaska Whales and Whaling. Alaska Geographic Society, Box 4-EEE, Anchorage 99509. Vol. 5, #4. $9.95 paperback.

Species by species accounts of Alaska whales and whaling history. Photographs, drawings, and range maps complement the text.

Ellis, Richard. The Book of Whales. Alfred Knopf, N.Y., 1980. 202 p.

Excellent comprehensive coverage of whales species worldwide. Big picture book format with line drawings and color paintings.

Kelly, John. The Great Whale Book. The Center for Environmental Education, Acropolis Books, Wash., D.C., 1981.

A great synopsis of whale species and their status.

Chart and Records:

Marine Mammals of the Western Hemisphere. National Oceanic and Atmospheric Administration. Available from the Superintendent of Documents (#003-020-00087-8), U.S. Government Printing Office, Washington, D.C. 20402.

Marine mammal chart with full color scale drawings of whales, dolphins, and seals.

Callings. Produced by Paul Winter. Two records and booklet of photos, narrative, and background on each species.

Traces the mythic journey of a sea lion pup who encounters other marine mammals. The animal's voices mingle with Winter's music.

Deep Voices: The Second Whale Record.

Includes two entirely new humpback songs plus Right and Blue Whale sounds.

Ocean of Song: Whale Voices.

Features a variety of unique songs: Orca in Puget Sound, humpback whales near Maui, ocean waves, sea birds and more.

Songs of the Humpback Whales. Produced by Roger and Katy Payne. Capitol ST 620, 1970.

Classic recording of the great range and variety of humpback communications.

Unit Four
Seashore Animals

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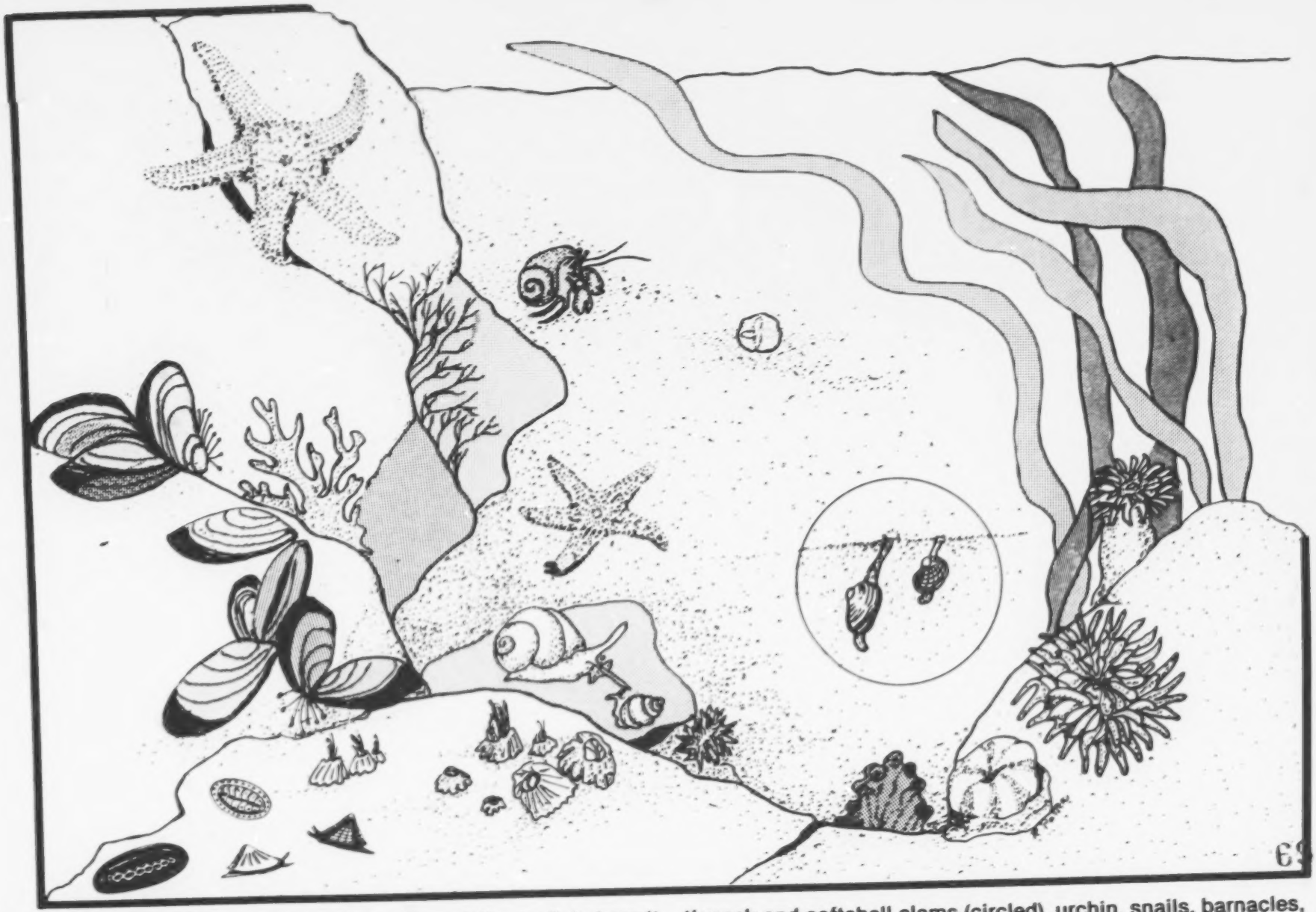
Objectives:

To help students:

- Discover and examine beach treasures (Activity 1).
- Enjoy poetry about the beach (Activity 1).
- Draw a beach on butcher paper (Activity 1).
- Recognize that sea stars vary in color, size and texture (Activity 2).
- Participate in making sandpaper sea stars, and in cutting out and coloring sea stars (Activity 2).
- Make model sea urchins out of clay or bread crumbs and glue (Activity 3).
- Play seashell tic-tac-toe (Activity 4).
- Learn that a seashell protects a soft animal from predators and from drying out in the air (Activity 4).
- Create a classroom aquarium for hermit crab (Activity 5).
- Feed crabs with bits of mollusk or frozen shrimp (Activity 5).
- Recognize that barnacles live in the ocean attached to hard surfaces (Activity 6).
- Identify, role play, and look for sea anemones at the beach (Activities 7 and 9).
- Complete worksheets of seashore animals (Activities 2-7 and 10).
- Draw or paint a giant litterbug and its effects on the classroom and beach (Activity 8).
- Explore the beach for seashore animals (Activity 9).
- Identify different beach zones (Activity 9).
- Learn a Sea Week song and make up additional verses (Activity 10).
- Write a class story about the trip to the beach (Activity 10).
- Make a beach treasure collage (Activity 10).

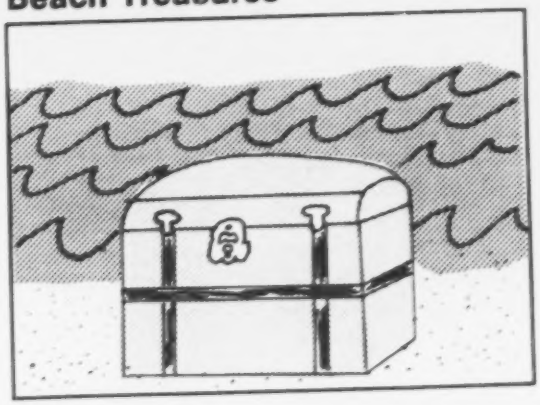


68 **Seashore animals.** Clockwise, from upper left: starfish, hermit crab, sand dollar, seaweed (laminaria), anemone (two with tentacles extended, one with tentacles retracted), sponge, littleneck and softshell clams (circled), urchin, snails, barnacles, limpets, chitons, mussels, rockweed, starfish.

To children as well as adults, seashore animals are an endless fascination. Any study of marine life should include a field trip to the beach if possible. Such a trip should be one of discovery, exploration and excitement. To prepare children for this experience, teachers should involve them in classroom activities which will help them better understand what they will see at the shore.

Most animals in this unit can be most easily found in rocky habitat at low tide. However, these animals also are found offshore from sand and mud beaches and occasionally will drift in. Fishermen often find such animals in their nets, and often are willing to save some for classroom study. The Sea Week Source Book details how to obtain and maintain a saltwater aquarium. To keep specimens alive for short periods before releasing them, keep them in gallon containers of sea water. Store in refrigerator. For Interior Alaskan students, such aquarium specimens can make this unit particularly exciting.

Activity 1
Beach Treasures



Background:

"Treasure" is an ideal concept with which to introduce children to seashore animals. The transition between nonliving beach treasures and the living jewels of the seashore is an easy one to make. The treasure theme establishes a sense of value which the teacher can explain in natural and aesthetic terms as well as monetary ones. And the treasure theme is easy to maintain, from this activity's opening of a treasure chest in the classroom to having a treasure hunt during your class field trip to the beach.

Vocabulary:

- treasure
- gems
- jewels
- net floats
- mermaid
- merman
- tide (review)
- seashore (review)

Materials:

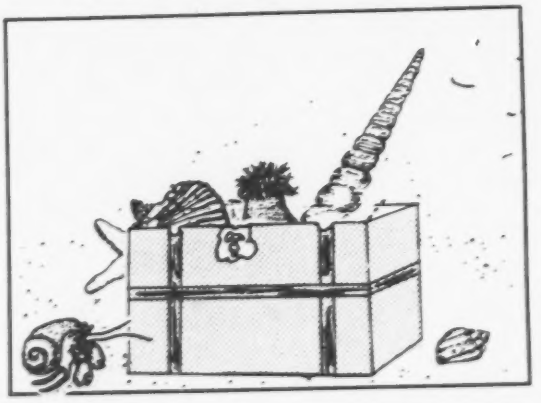
- large sheet of butcher paper
- felt-tip markers or crayons
- magnifying lenses

- poem:
  ...Treasures
- beach treasures (suggestions):
  ...driftwood
  ...shells
  ...sand
  ...glass net floats
  ...cork net floats
  ...old rope
  ...dried seaweed
  ...surf-sculpted rocks
- one surfworn colorful pebble for each student (dry, so the colors are subdued)
- glass jar half filled with water

Procedure:

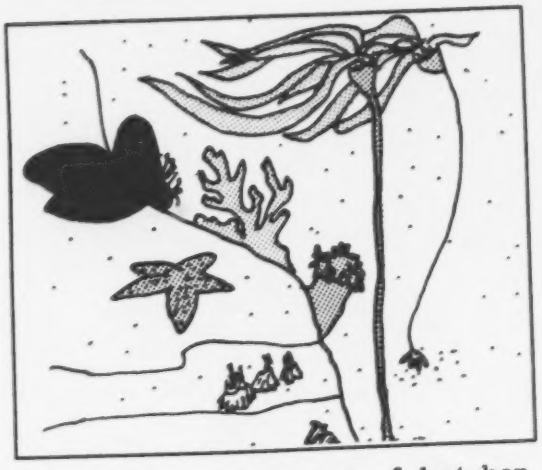
1. Bring an old sea trunk to class, or decorate a cardboard box as a "treasure chest," and fill it with beachcombing treasures, putting the surfworn pebbles at the bottom. Before showing the children what's in the chest, as them what they think it might contain. Tell them all the items are beach treasures. What might they find on the beach? Make a class list. Then one by one remove the items from the chest. Discuss each item as you take it out. Why is it a treasure? Do treasures have to be worth money? Pass each item around as you discuss it so the children can feel and see the textures and patterns.

2. Remove the surfworn pebbles from the chest and give one to each child. As you're passing them out, talk about how people sometimes find diamonds, rubies, pearls, silver and gold pieces on beaches. The currents, tides and surf have washed them ashore from shipwrecks. And here in Alaska, people "struck it rich" when they found gold on the beaches of Nome. Can any of the students describe a ruby? A diamond? A pearl? Silver? Gold? What about these pebbles that have been worn smooth by being rolled by the surf along the seashore? Are they as bright as rubies? As sparkly as diamonds? As shiny as pearls? No? Set the jar half full of water on a centrally located table so the students can gather round, and have them drop their stones into the water one by one. Do the stones look different in the water? Are the colors brighter? What colors do they see now?



3. Have the children look again at the other treasures from the chest. Let them put some of the seashells in the water jar to see if dryness has hidden any of the shells' beauty. Have them look at dry sand through a magnifying lens, then dampen the sand and let them look again. Do the grains of sand look like jewels now? Do they see any of the same colors in the sand that they see in the jar of pebbles? What about seashore animals? Are they

brighter and more colorful treasures when they're in the water?



4. Make a beach out of butcher paper. Have the children add crayon or felt-tip marker drawings of the animals they expect to see when they go to the beach (and add additional drawings as your class studies the animals in depth). Review the definition of tides (Unit 1, Activity 3). Explain that many animals live in the area between the highest tide and the lowest tide. These animals have to be ready for anything - hot sun, rain, snow, and bigger animals from both the land and the sea that like to eat them! The area between the high tide and the low tide is called the intertidal zone - the area we'll be exploring during our upcoming field trip to the beach!

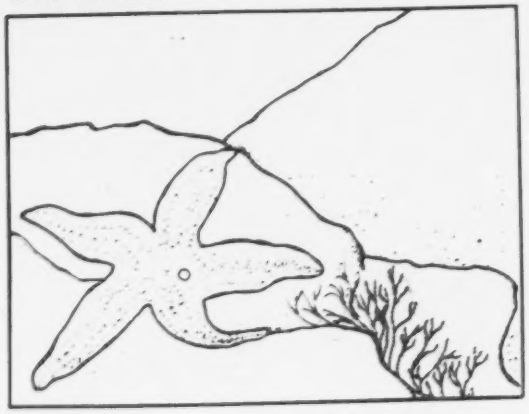
5. Whether you read the following poem without comment or discuss some of its imagery, your students probably are better able to visualize its contents now than before you began this activity.

TREASURES

Down on the beach when the tide is out
Beautiful things lie all about -
Rubies and diamonds and shells and pearls,
Starfish, oysters, and mermaids' curls;
Slabs of black marble cut in the sand,
Veined and smoothed and polished by hand;
And whipped-up foam that I think must be
What mermen use for cream in tea.
These and a million treasures I know
Strew the beach when the tide is low -
But very few people seem to care
For such gems scattered everywhere.
Lots of these jewels I hide away
In an old box I found one day.
And if a beggar asks me for bread
I will give him diamonds instead.

-Mary Dixon Thayer

Activity 2
Sea Stars



Background:

Sea stars belong to the group of animals called Echinoderms, a reference to their spiny skin. The term "sea star" is used rather than "star fish" so that they're not thought of as fish. As with their relatives the sea urchins, spines are an important part of the sea star body structure. Each sea star has a central area called a disc and from five to 50 rays that extend from it. The "underside" of the animal includes a mouth in the center of the central disc and, extending the length of each ray, a groove bearing the tube feet on which the sea star moves. Each tube foot in most species acts like a tiny suction cup which the star can cause to attach to any surface or cause to release. This suction and release of suction is accomplished by controlling the water pressure in a system of internal, water- filled canals.

The upper surface of the sea star bears elaborate miscroscopic structures, spines, tiny pincers for protection, and "fingers" or "gills" through which the animal takes in oxygen and disposes of carbon dioxide and other metabolic wastes. The most obvious structure on most sea stars is a roughly circular, bare area that is like a sieve plate through which water enters the canal system to maintain the proper pressure in the tube feet.

On Alaskan seashores there are several common sea star species. Most have long, scientific names such as Evasterias troschelii, but no easy common names. Thus, having children learn the specie name is not practical. What can be done, however, is to look at the sea stars carefully and decide by thinking about color, size and texture how many different kinds are found. (HINT: One species may be several different colors.)

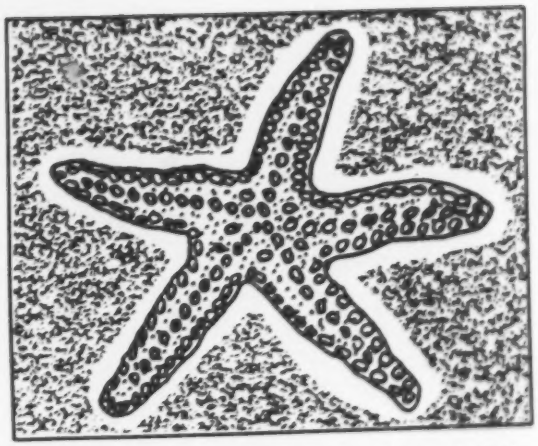
Sea stars are active, but slow-moving animals that spend most of their lives searching for food. The diet of animals of a particular species may include only one or a few kinds of food; but taken as a whole, sea stars feed on a wide variety of marine animals including other sea stars. Some stars are capable of extruding the stomach outside the mouth so that they can surround a food object with it and feed on something too big to be drawn through the small mouth opening.

Materials:

- books or magazines with sea star illustrations
- worksheet:
  ...Sea Stars (4A)

Procedure:

1. Show students the variety among sea stars. Then follow up with one or more of the following art projects:



Sea Star Mosaic: Use dried beans, seed pods, small stones, wood or construction paper, and glue. Let each child design his or her own sea star by creating a star-shaped design of small objects glued to a background.

Sand Paper Sea Star: Use rough sandpaper, crayons, scissors, and cookie sheet. Let each child cut a sea star shape out of sandpaper, and heavily crayon on a design. Then place finished sea stars on a cookie sheet. Bake in 250°F oven for 10 to 15 seconds, until crayon melts.

Coloring Sea Stars: Using the Sea Star worksheet, have children create their own color design for a sea star.

Mural: Use various media - tissue paper collage, wet chalk, melted crayon, water colors, crayon resist. Depict a variety of sea stars and glue them to your beach mural (Activity 1, Procedure 4).

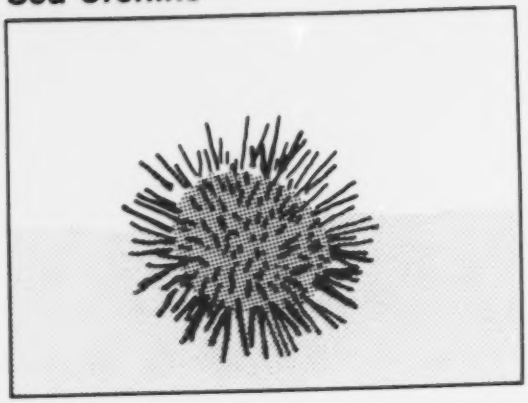
Sea Stars

Have the children look for sea stars. When they find one, ask them:

- Where did you find this sea star? Is it close to the water or high up on the beach?
- Was it attached? To what? How tightly?
- Does the sea star live by itself or in a group?
- What other animals are nearby?
- How does a sea star move?
- Touch a sea star. How does it feel? Do sea stars that look different from each other feel different?
- Is it alive or dead? How can you tell?

Have children compare sizes, number of rays, colors of several individuals.

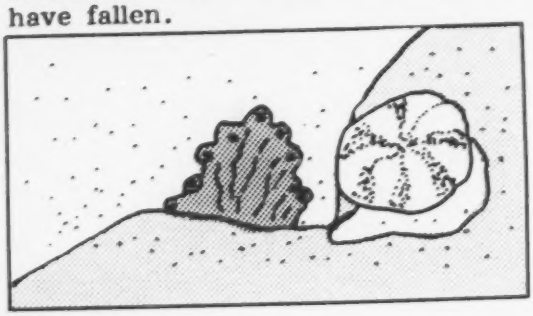
Activity 3
Sea Urchins



Background:

Sea urchins, like sea stars, are spiny members of the Echinodermata. Each has a rounded internal skeleton called a "test." On the test are many knobs to which the spines are attached and on which the urchin pivots. An urchin's spines are mainly protective, but also help in locomotion. Like sea stars, urchins have tube feet. These are on long, slender "stalks," that can be stretched out to extend beyond the tips of the spines. The tube feet help the urchin move, help it keep itself clean, and sometimes help it move food to its mouth. The mouth, which is located within an elaborate structure that because of its shape is called Aristotle's Lantern, is in the center of the underside of the body. Urchins often feed by scraping algae or tiny particles of food from rocks. They also feed on large algae and on dead organisms. Three kinds of sea urchins are commonly found in Alaska: the green sea urchin, the purple sea urchin, and the red sea urchin. A fourth kind, the heart urchin, is present (but rare) in Alaskan waters below the low tideline.

Sand dollars are flattened relatives of sea urchins. But their spines, instead of being up to three or four inches long, are only about one-sixteenth of an inch long and so closely packed that the animal looks and feels like a velvet pancake. Sand dollars live buried partly or entirely in subtidal sand or mud, feeding off organic matter that is caught in their spines as it drifts in the ocean currents. In Alaska, most sand dollars are a light fleshy color. But in several areas - particularly in Bristol Bay waters - they become bright green. Scientists don't yet know what causes the color phenomenon. Most of the sand dollars students find washed up on the beach actually are bleached sand dollar skeletons from which the spines have fallen.



Materials:

- tempera
- transparencies or pictures of sea urchins
- baker's clay or bread crumbs and glue
- worksheet:
  ...Sea Urchin (4B)

Procedure:

1. Show children the urchin pictures and discuss with them the animal's shape and habits. Use the Sea Urchin worksheet. Have students color the urchin green or purple. (The red sea urchin

has much longer spines.) Suggest that they draw additional baby urchins on the sheet. Count them aloud. The left side of the worksheet is an urchin test or skeleton which, when you find one on the beach, usually has been bleached white by the sun.

2. Have each student design his or her own sea urchin using clay (baker's clay) or bread crumbs and glue with toothpicks imbedded for the spines. Bake in 350°F oven until hard. Let children paint the urchins with tempera paint. To make Baker's clay, use: 1 c. flour; 1 c. salt; and 1 rounded tsp. powdered alum. Mix these ingredients. Add water slowly and knead until the texture of clay. Store wrapped in wet cloth and plastic.

   For the bread and glue variety, use: fresh white bread and Elmer's or white glue. Crumble bread. Mix with it enough glue to form a dough. Shape into desired form and let dry. When models are dry, spray with clear sealer or coat with nail polish before coloring with water colors or other paints.

3. Field Trip Activity Card:

Sea Urchins

Have the children look for sea urchins. When they've found some, ask them:

- What sizes and colors of urchins did you find?
- Where did you find them? Are they low on the beach or high?
- Who lives nearby?
- Are any of the urchins in large groups?

With the children:

- Compare sea urchin tests (skeletons) with a live urchin.
- Look at the knobs on which the spines turn and the holes in the test through which the tube feet extend.
- Examine the delicate bones of the complex mouth structure (Aristotle's lantern).
- Feel and describe the textures and pattern of the test.

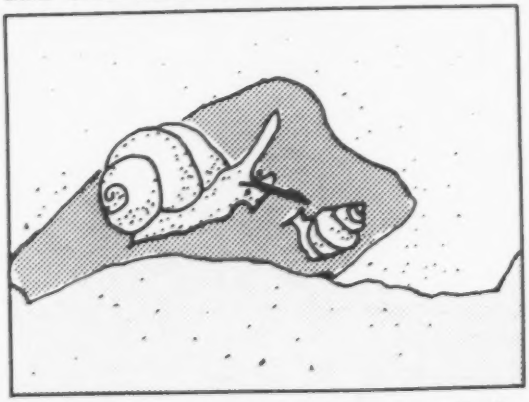
Have the children carefully hold a sea urchin. (Very carefully. Spines can cause infection if they penetrate the skin.)

Have them hold still and concentrate on thinking about how the spines and tube feet feel as the urchin moves them.

Activity 4
Sea Shells

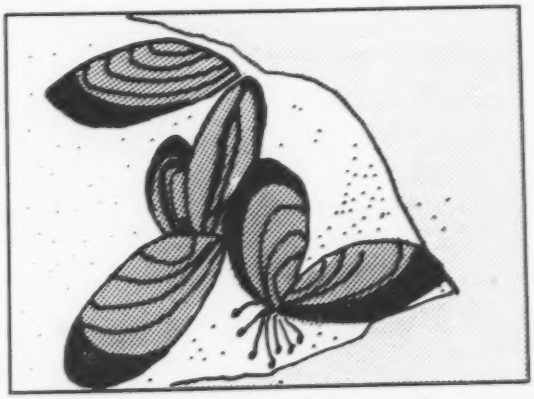
Background:

Seashells belong to a very large group of animals called mollusks. This group includes limpets, chitons, snails, nudibranchs, clams, mussels, and even the octopus and squid. The most commonly seen seashells on Alaskan beaches are the shells of snails and clam-like mollusks.



Snails are univalves because their shells have only one part or valve. Many univalves have shells that spiral around a central column, but the cap-shaped limpets are univalves too. Inside the hard, protective shell of a univalve lives a soft animal that has one broad muscular foot on which it moves, and a head that is equipped with eyes (in most snails), sensory antenna, and a mouth. The mouth includes a "radula," which is a ribbon-like structure equipped with rows of teeth that are used to scrape up food. Part of the soft animal called the mantle produces the shell; and as the animal ages, both the soft animal and its shell grow larger.

In addition to a shell, many univalves are equipped with an operculum. The operculum is a tough, horny "door" that can be used to seal up the aperture of the shell. The soft animal will draw inside to protect itself from a predator or from drying out in the air if it is left exposed when the tide goes out.



Clams, cockles and mussels are bivalves, or animals with shells of two parts or valves. In general, bivalves are less active than univalves. They are often found burrowed beneath the surface, completely hidden except for the tip of a tube-like siphon which they use to bring them food and oxygen. Exceptions are the mussels, which usually live above the surface.

Seashell designs are almost endless in their variety and it is hard to resist picking up a pretty shell. Remind children, however, that if the animal inside the shell is alive,

it cannot survive long away from its natural home. If a specific activity has been planned, collecting a few empty shells is fine, but try to encourage students to enjoy the beach and its creatures but to leave it as nearly as possible the way they found it.

Vocabulary:

- snail
- clam
- limpet
- chiton
- shell
- bivalve
- univalve
- octopus
- mollusk

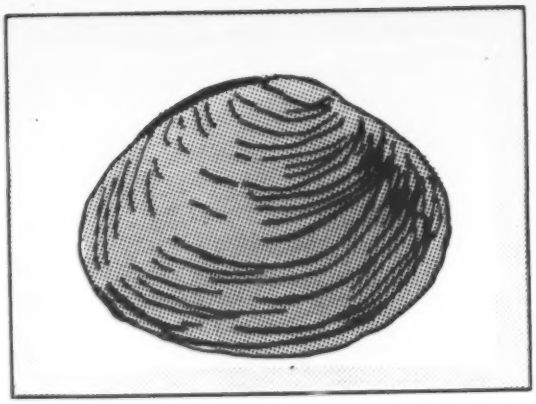
Materials:

- masking tape
- empty shells
- pictures or drawings of shells, clams, snails
- worksheets:
  ...Feed the Octopus (4C)
  ...Bivalves and Univalves (4D)

Procedure:

1. Ask children to bring to class shells they might have at home. Set up a group of shells for the students to handle and examine. Divide the shells by size, then by shape, then by whether they are bivalves or univalves. Use the Bivalves and Univalves worksheet. What does the living animal look like? Discuss the importance of not taking a live animal away from the beach.

2. Make tic-tac-toe lines on the floor with masking tape. Have children play the game using shells as markers.



3. With the class or individuals, discuss how it would feel to be a shell, an animal's home. What kinds of things would you see, feel, think about? Write a story after brainstorming these ideas.

Additional Activities:

1. Art: Have students draw pictures of several shells and make a shell book.

2. Science: Invite older students who are studying shells to come to the class to show shells to the younger students and talk about them.

3. Mathematics: Number the compartments of a muffin tin 0-11. Give the child 66 shells and ask him or her to place the correct number of these in each compartment.

4. Language Arts: Read poetry about shells.

5. Mathematics: Glue small shells onto numbered tongue depressors for counting practice.

6. Home Economics: Make clam chowder for the children to taste, using fresh or canned

clams. BE CAREFUL ABOUT USING CLAMS YOU HAVE COLLECTED ON THE BEACH. ALASKAN CLAMS MAY CONTAIN A TOXIN (PARALYTIC SHELLFISH POISONING). If in doubt, contact local Fish and Game authorities

7. Art, Science: Explaining that octopuses sometimes eat clams, mussels and other bivalves by prying them open, pass out the Feed the Octopus worksheet. After the students work its maze, maybe they'd like to color the octopus. Explain that octopuses can change color to match their surroundings. What color would the children color their octopus to match their desk? Their clothes? The floor?

8. Field Trip Activity Card:

Shells

Leader: Encourage children to find as many different kinds of shells as they can - both snails and clams. Lead them to discover whether the shells are empty or contain living animals. If a shell is still home to a live animal, discuss with the child the need to leave it just as it was found.

Locate a shell containing a live mollusk and watch it with the children for several minutes. Can the children see it moving its foot, eyes or antennae? If the animal is moving over algae or other growth, it is likely to be grazing, much like a cow. Remind students that the food is scraped into the animal's mouth (radula) by rows of teeth usually too small to see. Ask the children why they think such animals need shells.

Find an empty shell. Have the children hold it to their ears. Can they hear the ocean?

Have the children find a univalve (one valve or shell).

Have them find a bivalve (two shells).

See who can find the biggest shell, then the smallest.

See if the children can find a shell with a small hole in it. Explain that the hole probably was drilled by another animal such as the moon snail so it could suck out the animal for its dinner.

Mussels

Have the children look at the mussels. Ask:

- Are they living creatures?
- How are they attached to the rocks? (Let kids discover the byssal threads. Test the strength of the threads.)
- Why are the threads so strong? (So the mussels can hang onto the rocks and protect themselves from waves.)
- Do you think mussels can move if they want to? (They can, with a foot like a clam's.)
- Why might a mussel want to move? (If it becomes too crowded against its neighbors, or can't get enough food.)

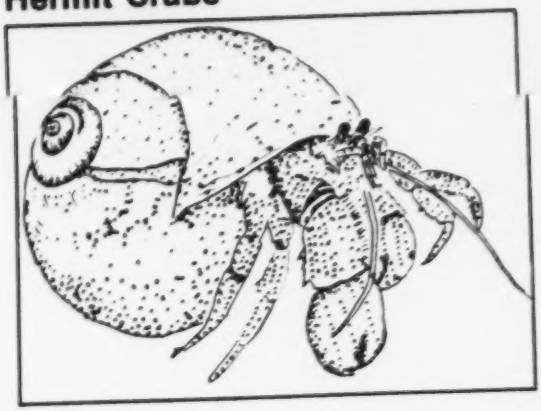
Locate mussels in the water with their shells open. Ask the children what they think the open-shelled mussels are doing (feeding).

Find mussels out of the water with closed shells. Why are the shells closed? (So the animals inside won't dry out.)

Count the number of mussels you see in one group.

Remind the children that mussels are good to eat, but people need to be careful because mussels often are the first mollusks on a beach to become contaminated with the tiny, too-small-to-see animals (dinoflagellates) that cause paralytic shellfish poisoning. So mussels shouldn't be eaten unless the Alaska Department of Fish and Game has certified the beach as safe.

Activity 5
Hermit Crabs



Background:

Hermit crabs are crustaceans, related to shrimp, other crabs, lobsters, and barnacles. They are adapted to living with their abdomens tucked into empty shells or other protective structures. They do not have a shell of their own. Thus, while the walking legs and forward part of the animal have a hard protective outer skeleton, the animal's abdomen is soft. Because most hermit crabs live within coiled snail shells, their abdomens are curved and end in a hook-like structure that helps anchor the animal firmly in the shell house.

Like all other crustaceans, hermit crabs can grow only by shedding their tough external skeleton and replacing it with a new, larger skeleton. As a hermit crab grows, it must also find a larger snail shell for itself. Thus, periodically, a hermit seeks out a new, larger empty shell, quickly releases his grip on his old home, and takes up residency in the new home of his choice. The crabs don't attack snails; rather, they select their new homes from among empty shells. The crabs often are observed trying on shell after shell for size, until they're satisfied with one that fits.

For the most part, hermit crabs are scavengers, feeding on whatever bits of animal material they can find.

Most hermit crabs found on Alaskan beaches are small, often living in the small cone-shaped shells of periwinkle snails. Occasionally a large, sometimes bright red, hermit crab may be found above the water level, but in general, the larger hermit crabs live in deeper water.

Vocabulary:

- hermit crab
- periwinkle

Materials:

- a flat glass, plastic or enamel pan
- several hermit crabs from a local beach
- dead mollusks or shrimp (for crab food)
- clean sea water
- worksheet:
  ...Hermit Crab (4E)

Procedure:

1. Place clean sea water and hermit crabs in the pan. (Don't use a metal pan. Metals released into the water by corrosion will kill the crabs.) Either tip the pan so that there is a dry end or put a rock or pebbles in the pan so that the hermits can get out of the water. Put the pan and crabs in the coolest location in your room. Use a thermometer to help keep track of the temperature. In order for the crabs to survive, the salt water

should be as cool as possible and should be changed every few days so it will be clean and not depleted of oxygen. Use saltwater ice cubes during the day and refrigerate periodically throughout the day and at night.

2. Feed the crabs bits of recently dead mollusk or small pieces of frozen shrimp. Remove food pieces that are not eaten.

   Name your crabs. Encourage children to observe and talk about the appearance and behavior of the hermits. Try some experiments. Place extra empty shells in the pan and see if any of the hermit crabs switch shells. Cover one half of the pan with a piece of cardboard and see to which side the crabs go.

   Check food preferences. Do the crabs spend more time in or out of water? How do they eat? Take the crabs back to the sea after your study.

3. Field Trip Activity Card:

Hermit Crabs

While the children are observing hermit crabs, ask them:

- How can you tell this is a hermit crab and not a snail?
- Where was it found? In the dark, in the sun, where it is warm, or cool under a rock, in a crevice, on sand, mud?
- What other kinds of animals or plants were living nearby?
- How does the hermit use its claws? Are the claws different sizes? Why?
- How does it move?

Leader: If two or more hermit crabs are found, compare sizes, colors, types of shell "homes."

Watch for this behavior: Hermit crabs often cling to the sides of bedrock tidepools (or on algae in these pools) in large numbers, and when a shadow looms over the pool (as that of a person peering in) many of them will curl up defensively and tumble down the sides of the pool to rest on the bottom. Discuss with the children how this escape behavior helps the crabs survive?

4. Do the Hermit Crab worksheet and the following finger play:

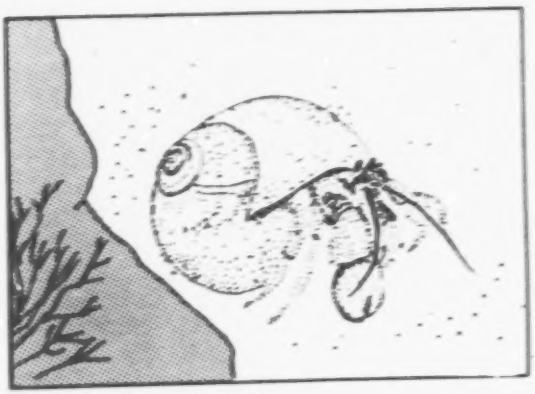
I'm a little hermit crab
(Fingers of one hand creep across the table.)

Looking for a hermit shell
(Cup the opposite hand a short distance in front of the creeping fingers.)

I see one.

Here I come
(The creeping fingers jump inside the cupped hand.)

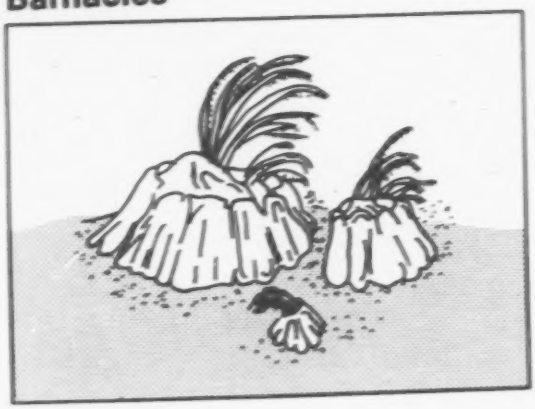
This one suits me very well.



Additional Activities:

1. Language Arts: Read or paraphrase A Shell for Sam (see Bibliography).

Activity 6
Barnacles



Background:

Barnacles are crustaceans, closely related to crabs and shrimps. When they are very small, barnacle larvae live in the open water and (in most cases) look like shrimp or crab of the same size.

When the larva has reached a certain size and stage, the barnacle settles to the bottom of the sea, attaches to a hard surface by its head, and begins to grow a hard shell around itself. Its legs become feeding structures.

The six-sided barnacle has a trap door made up of four plates. When it chooses, the barnacle can slide the plates of the trap door open, extend its legs and sweep them through the water to catch the tiny plants and animals called plankton, which are its food.

Once it settles to the sea floor and grows its hard covering, a barnacle never moves. It may live for three to five years.

Materials:

- live barnacles in a plastic pan of salt water
- pictures of barnacles
- worksheet:
  ...Barnacle (4F)

Procedure:

1. Show the children the live barnacles. A barnacle is a tiny, soft animal, like a crab or shrimp, that has built a hard house around itself for protection. The barnacle is actually standing on its head, pushing its feet out to get food. Use the magnifying tripod so students see the animals feeding. Then do the Barnacle worksheet.

2. Have the children role play barnacles by standing on their heads, sticking their feet out to get food (plankton).

3. Field Trip Activity Card:

Barnacles

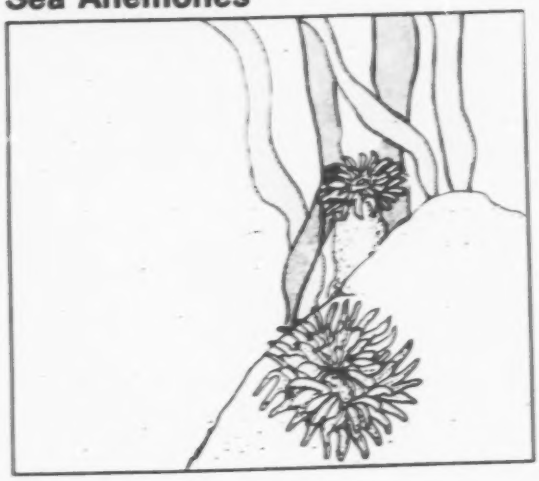
Have the children:

- Look for different sizes of barnacles. Different sizes means different ages.
- Feel the texture of a barnacle-covered rock.

Ask youngsters:

- Do barnacles settle on other things besides rocks? Algae maybe? Other animals? Wood?
- What happens when they grow larger and crowd tightly together? (This is fairly common.)
- What do you think might eat barnacles? (Gulls, which open them by dropping them from heights, starfish which pry them open, sea otters which pound them open with rocks.)

Activity 7
Sea Anemones



Background:

Anemones belong to a group called the Cnidaria which also includes jellyfishes and corals. The body of an anemone consists of a thick column, the top of which bears numerous tentacles. The tentacles capture food for the animal and convey it to the mouth which is located in the middle of the tentacles on the top of the column.

Anemones depend on the water for support. When they are stranded by a receding tide, they look like gelatinous masses. When the tide returns and covers them, however, they can again expand into an upright position, in which they once more look like lovely sea flowers.

No one knows how old an anemone may get to be, but people who have studied them believe that they may live to be more than 100 years old, living just as long as they have food and are left alone. Anemones do not move very fast, but they can creep over the sea floor very, very slowly, using the base of the column as a foot.

Vocabulary:

- anemone
- tentacle

Materials:

- pictures of an anemone
- worksheet:
  ...Anemone (4G)

Procedure:

1. Share the anemone pictures with the students. Have the children think about what the animals look like and the kinds of movements they might make. Using the Anemone worksheet, encourage youngsters to express their own concepts of the animal.

> a-nem-o-ne (ə nem ə nē) n. [L. Gr. anemone, altered, after anemos, wind ? Sem. name] 1. Bot. any of a number of related plants of genus (Anemone) of the buttercup family, with cup-shaped flowers that are usually white, pink, red or purple 2. Zool. same as SEA ANEMONE

2. Look up anemone in the encyclopedia. Point out differences and similarities between flowers and sea anemones.

3. Have a group of students stand back to back in a tight circle with arms waving in the air to portray an anemone. Show reactions to tide ebb and flow, food passing by, threat of danger. Then have each student individually imitate an anemone. Here comes a school of little fishes! Grab them and pull them in and zooph (swallow them)!

4. Field Trip Activity Card:

Sea Anemones

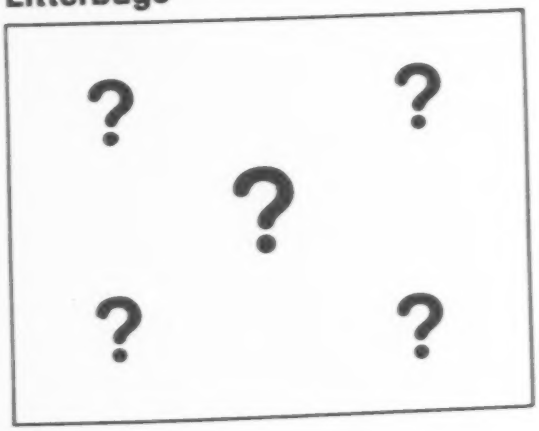
Encourage children to feel the anemone and describe how it feels.

Ask:

- Where did you find the sea anemone?
- Does it live alone or with other anemones?
- Is the anemone attached to anything?
- Find an anemone under water and gently place bread crumbs, cheese, or meat from your lunch on its tentacles. What happens?

Remind the children that anemones - if left undisturbed - will live to be very old - probably older than the children themselves will ever be!

Activity 8
Litterbugs



Background:

At all grade levels in the Sea Week curriculum students should develop their abilities to reason and to consider the man-made problems related to marine, wetland and river environments. The problem of litter can be presented graphically to kindergarteners either in the classroom or outdoors. Through example and discussion, encourage students to achieve an understanding of littering and its negative and positive effects on the environment.

Vocabulary:

- litterbug

Materials:

- paper
- crayons or finger paints

Procedure:

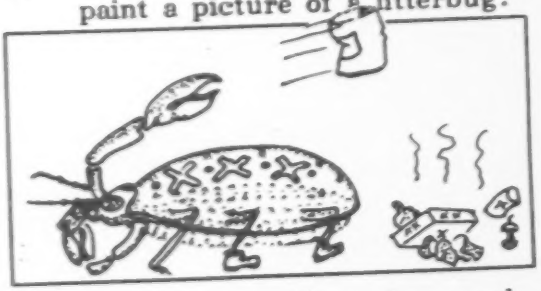
1. Let's pretend! Involve students in the following flight of fancy:

   Look around the room. Is it neat? Could you find your table? Your crayons? Your coat in it?

   Now pretend there is a giant litterbug. What does this bug look like? The litterbug keeps walking through our room and each time it does, it drops another piece of litter. First, it drops a soda pop can as big as an oil drum. Then it drops a kleenex as big as a bed sheet. What else does the litter bug drop in our classroom?

   After the litterbug has been at work for a week or a month, do you think you could still find your coat or desk or crayons? Would it be a help or a trouble, or both, if a giant litterbug were at work in the classroom?

2. Encourage children to draw or paint a picture of a litterbug.



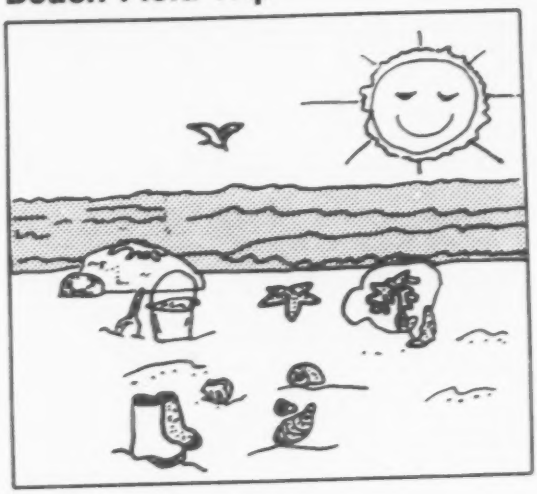
3. On a succeeding day, ask students to think about the sizes of animals that live on the beach. Use hands and classroom objects to demonstrate size. How big is each child compared to a sea star, hermit crab, barnacle, duckling or fish? Might a child seem like a giant to a snail? If the child-giant were a litterbug and dropped pop cans, candy wrappers or lunch bags on the beach, how would the animals be affected? Would it make their world better or worse? How?

4. Encourage students to realize that littering the natural environment can have negative and positive effects. (Litter is unsightly, may alter the environment of living organisms in a detrimental way - sometimes even making it impossible for the inhabitants to continue living there - though it may provide new places for some animals or plants to live. If we care about our natural environment, though, it is important to keep our shores, rivers and wetlands as natural as we can.) In the discussion, use specific examples:

   - Pretend you are a snail and a plastic bag lands on top of you. How would you feel? What might happen to you?
   - How would it feel to be a tiny fish when someone pours a can of soda into the water?
   - What would happen to a sea star that is looking for food and finds its way blocked by pop cans?

5. Before taking a field trip to the shore, tell children that you or helpers will have bags into which children may deposit litter. Encourage students to try to leave the area free of material that may have been left by the "giant litterbug." Make sure children are careful not to be "giant litterbugs" themselves.

Activity 9
Beach Field Trip



Background:

The field trip is the highlight of Sea Week, as well as the culmination of much that your class has learned. Field trips do take more organization than most other Sea Week activities, but are well worth the effort.

Materials:

- garbage bags for litter
- task cards from throughout the book

Procedure:

1. Select a date and location for your field trip. A trip coinciding with a low tide would be best in southern portions of Alaska, where much more intertidal zone life is exposed when the tide is out. In northern Alaska the timing isn't as crucial because the tide is barely noticeable.

   If you're not thoroughly familiar with the intertidal life of your local beaches, you might consider taking along an expert. But if one isn't available, don't hesitate to go anyway, and learn along with the children.

2. Arrange transportation. Consider several short trips if the beaches are nearby.

3. Send notes to parents inviting them along as group leaders; or arrange for high school students or bilingual or special education staff to assist you. In the notes, include information on clothing, snacks and lunch.

4. Include lots of discovery time in your field trip. Review this volume's introductory section, "Tips for Teachers," page vii, for suggestions on planning the details of your trip.

5. Prepare students for the trip by previewing what they'll be doing, and by developing observation skills and conservation rules.

6. Check through the field trip activity cards contained in each unit, and photocopy those you'd like to distribute to trip leaders.

   Here are two more that might prove valuable:

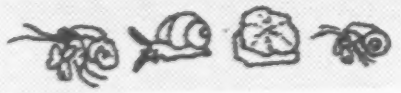
Beach Intertidal Zones

Help the children find the different beach zones and their inhabitants. On sloping mud or sand beaches, the zones are spread out over much greater distances than they are on steep rocky beaches.

Walk slowly from the upper beach to the water and back. Have the children keep track of what they see. As they look back over where they've walked, can they see any color changes? (Perhaps a dark green band of seaweed, dark blue bands of mussels, a white line of barnacles, the driftline on the upper beach where the last high tide reached - and the storm tideline at the top of the beach where there are large pieces of driftwood.)

Each beach is different. Have the children close their eyes and tell you where they saw each of the different animals as they walked toward the water. Walk the zones one more time. On the back of this card, draw a rough map of the zones and their animal inhabitants.

Beach Critters



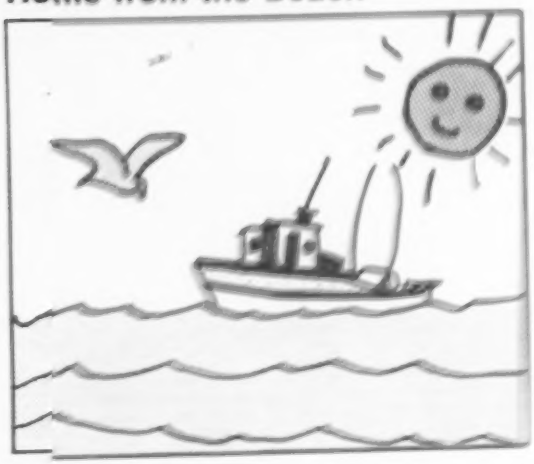
At low tide, the chief chore of most beach inhabitants is to avoid drying out. Encourage children to discover ways and places animals use to keep damp.

When the water level begins to rise with the incoming tide, animals that once again are submerged become increasingly active. Ask children to look for the increased activity and explain what the animals are doing (feeding).

Point out where beach animals make their homes: on rocks, shells, driftwood. Observe them carefully for several minutes, but leave them where they are.

Look for telltale signs (holes, tracks, mounds) of animals that live beneath soft sand or mud. By these signs, have the children count the number of animals that are hiding.

Activity 10
Home from the Beach



Background:

Capitalize on the momentum of the beach field trip by using it as an impetus to learning in all subjects. Reminiscences of the sea can add zest to your class for the rest of the year!

Materials:

- crayons or finger paints
- drawing paper
- beach treasures
- Sea Week Song
- worksheets:
  - Beach Matching (41)
  - Beach Animals (41)

Procedure:

1. Review the field trip events. Add pictures of your beach visit.
2. Learn the Sea Week Song and make up additional verses.
3. Write a class story to go with your mural, or make a book about the field trip.
4. Have the students make a collage with their beach treasures (empty shells, pieces of crab shell, driftwood, pebbles, dried sea weed, sand). Make bases for the collage with flat pieces of driftwood, a board covered with burlap, or stiff cardboard. Have the children arrange the treasures on the base, then glue everything in place as an individual or group project.

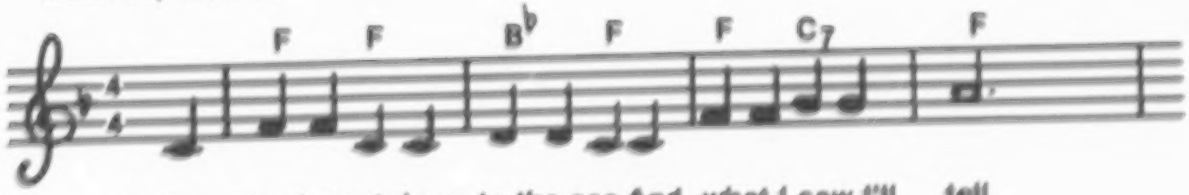
5. Use the Beach Matching and Beach Animals worksheets for review, and for introducing the children to two echinoderms that haven't been covered in this unit: the brittle star and the sea cucumber. Brittle stars have arms that fall off easily, making it easy for them to escape from predators. The sea cucumber is very soft. It sometimes regurgitates its entire digestive system to escape from animals that chase it. But it can grow the system right back!

Ruth Mai
Seward, Alaska

Sea Week Song

May 1981

Autoharp chords



1. One day I went down to the sea And what I saw I'll tell.
2. One day I went down to the sea And what I saw I'll tell.

I saw a lit- tle hermit crab in an old old small shell.
I saw a lit- tle hermit crab With eight legs on its shell.

Chorus

Heigh ho to the sea. Come and look with me.

Heigh ho to the sea see what we can see.

Seashore Animals Bibliography

Children's Literature:

Garelick, May. Down To The Beach. Illustrated by Barbara Cooney. Four Winds Press, New York, 1973. 42 p.

A gentle, lyrical book showing and describing a day at the beach. Children discover waves, tides, tide pools, shells, crabs, boats, buoys and foghorn. Beautiful watercolor illustrations.

Hurd, Edith T. Starfish. Thomas Crowell, New York, 1962.

A Let's Read and Find Out Series with a brief explanation of life cycles, feeding habits, regeneration. Attractive illustrations.

Rorn, Bernice. The Beachcomber's Book. Illustrated by Arabelle Wheatley. The Viking Press, New York, 1970. 96 p.

Filled with ideas on crafts, identification of collections, recipes, and identification of common shells and seaweed.

Schultz, Charles M. Snoopy's Facts & Fun Book about Seashores. Random House, New York, 1980. 96 p.

Combines humor and facts in portraying the seashore environment.

Selsam, Millicent. Plenty of Fish. Harper and Row, New York, 1969. 62 p.

A Science I Can Read Book. A child's story about securing and caring for goldfish.

Shaw, Evelyn. Octopus. Harper and Row, N.Y., 1971. 61 p.

A Science I Can Read Book about octopus.

Teacher's Reference:

Abbott, R. T. Seashells of North America. Golden Press, New York, 1968. 240 p. Paperback or hard cover.

Describes shell types and their habitats. Includes general information on collecting, use of the Golden Field Guide series.

[illegible] The Life of a Seashore. [illegible], [illegible], N.Y., 1980. 48 p.

Discusses ecology, relationships, life cycles, adaptations, the changing face of the sea, study of nature, and concepts to experiment with. For middle level students.

Barr, Lou and Nancy. Under Alaskan Seas - A Guide to Shallow Water Marine Invertebrates. Alaska Northwest Publishing Company, Anchorage, 1983.

Specific to Alaskan waters, this book is the perfect complement to the Sea Week Curriculum Series. Its excellent underwater photos are supplemented by descriptive text that includes species descriptions, ranges and natural history.

Calvin, J. Between Pacific Tides, Fourth Edition. Stanford University Press, Sanford, California, 1968. 614 p.

In-depth descriptions of various shore types and their invertebrate inhabitants. Photographs and line drawings.

Carl, G. C. Guide to Marine Life of British Columbia. British Columbia Provincial Museum, Victoria, B.C., Canada, 1972.

Includes a variety of information on seashore animals, including birds and fish. Illustrated by line drawings.

Crowley, Walt. The Seattle Aquarium Guide to Life in the Sea. Seattle Aquarium, Seattle, 1981. 78 p.

Discusses ecological relationships. Color photos and drawings.

Hoss, G. E. The Sound and the Sea: A Guide to Northwestern Marine Invertebrate Zoology. Washington State Dept. of Printing, Olympia, 1977. 174 p.

Species by species descriptions of seashore animals. Black and white photographs of almost every species make it easy to use as a field guide.

Harlo, Rick M. Tidepool and Reef Marine Life Guide to the Pacific Northwest Coast. Hancock House Publishers, Ltd., Vancouver, B.C., 1980. 95 p.

Tide pool animal descriptions, beautiful color photographs.

Hoyt, John H. Field Guide to Seashore. Houghton Mifflin, Co., Boston, 1971. 96 p. Paperback.

Discusses tide, currents, and sea coast geology. Line drawings.

Kozloff, Eugene N. Seashore Life of Puget Sound, Strait of Juan de Fuca and Northern San Juan Islands. University of Washington Press, Seattle, 1973. 282 p. Paperback. Illustrations.

Descriptions of the diverse groups of seashore animals. Includes color photographs and line drawings.

Rice, T. Marine Shells of the Pacific Coast. ERCO, Inc., Tacoma, Washington, 1973. 102 p.

Brief shell descriptions, color photographs.

Snively, Gloria. Exploring the Seashore. The Writing Works, Inc., Mercer Island, Wash., 1978. 240 p.

Descriptions of a variety of seashore animals by habitat. Includes birds and fish. Illustrated by line drawings and color photographs.

The Sea World Alphabet Book. Sea World Press, 1250 Sixth Avenue, San Diego, CA 92101, 1979. 32 p.

Features a sea photo on each page together with a couplet such as, "B is for Beluga, one kind of whales, that's all white and smooth from its head to its tail."

Charts:

Mollusks and Crustaceans of the Coastal U.S. National Oceanic and Atmospheric Administration. Available from the Superintendent of Documents #003-020-00087-8, U.S. Government Printing Office, Washington, D.C. 20402.

Mollusk and crustacean chart with color drawings of these underwater inhabitants.

Marine Fishes of the North Pacific. National Oceanic and Atmospheric Administration. Available from the Superintendent of Documents #003-202-00051-7, U.S. Government Printing Office, Washington, D.C. 20402.

Marine fishes chart with color drawings of the various fishes.

Unit Five Seaweed

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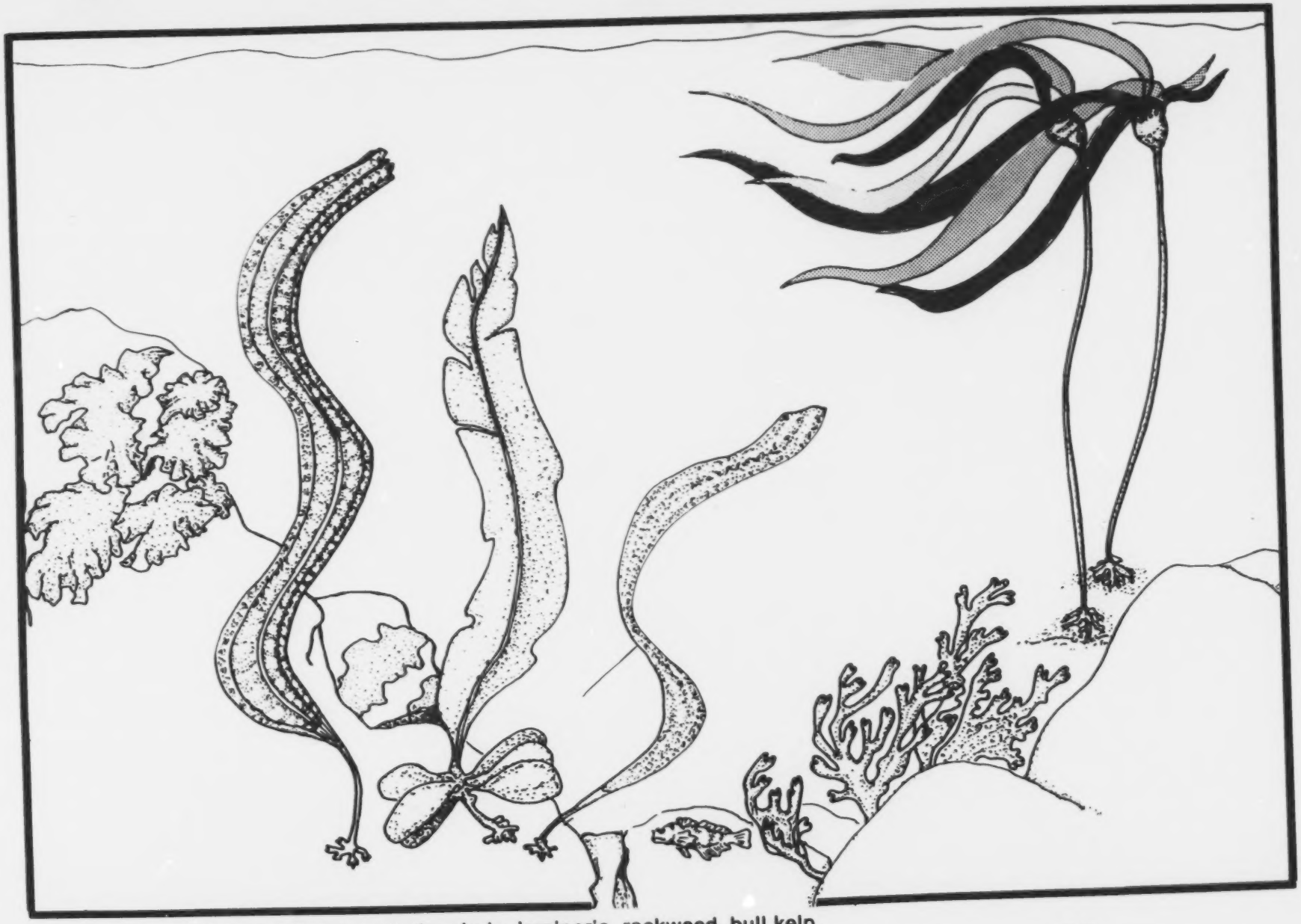
Objectives:

To enable students to:

- Cook and taste seaweed (Activity 1).
- Carve a bull kelp bladder like a pumpkin (Activity 2).
- Make note paper, cards, bookmarks, wall hangings, or placemats from pressed seaweed (Activity 3).
- Weave seaweed into an object d'art (Activity 4).
- Practice a seaweed dance (Activity 4).
- Write a story about seaweed (Activity 4).
- Observe seaweeds on the beach (Activity 5).
- Make a beach in a box (Activity 5).
- Recognize that seaweeds are important because they provide food for many animals and provide places for some fish and invertebrates to hide (Activity 5).



Seaweed. From left: sea lettuce, costaria, alaria, laminaria, rockweed, bull kelp.

99

Seaweeds are algae: plants which have no roots and do not produce flowers, but do contain chlorophyll - the green pigment that plants must have to manufacture their own food. Algae are distinguished from most green land plants by absence of special "woody" cells which add mechanical support and are part of a water-conducting system. Since algae live in the water, they don't need a water-conducting system. And since the water supports their forms, seaweed don't need the rigid woody tissue.

There are many forms of algae, both in fresh water and salt water. Some of it is microscopic - invisible to the naked eye. Seaweeds are algae that live in the marine environment and macroscopic - visible to the naked eye. In size, seaweed range from tiny, barely visible plants to huge plants more than 100 feet long.

The major groups of seaweeds are divided on the basis of color. Green algae are so colored by the chlorophyll they contain. Red and brown algae have additional pigments which give them the predominant red or brown color. The presence of red or brown pigment enables the plant to produce food with different wavelengths of light than is used by green algae. In general, green algae are found in the most shallow waters, brown algae are somewhat deeper, and red algae can live deepest of all.

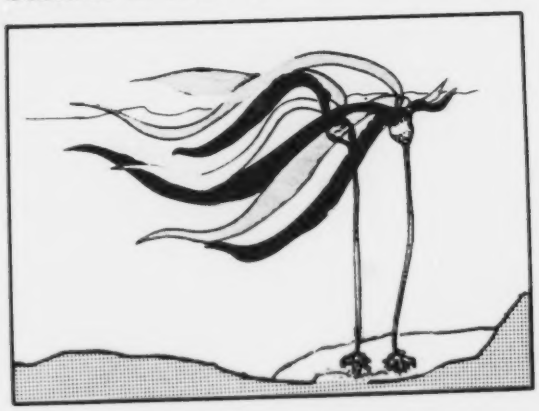
Although some seaweeds grow as free-floating plants, many kinds also may be found growing on hard surfaces. They do not have roots, but instead cling to rocks, pilings or shells with their special means of attachment called a holdfast. The holdfast may look like a small circular button or may consist of numerous finger-like projections that grow downward and cling to a hard surface.

Seaweeds are important because they provide food and shelter for many animals. Many kinds of seaweeds are edible by humans, including many that grow in Alaskan waters.

Activity 1
Tasting Seaweed

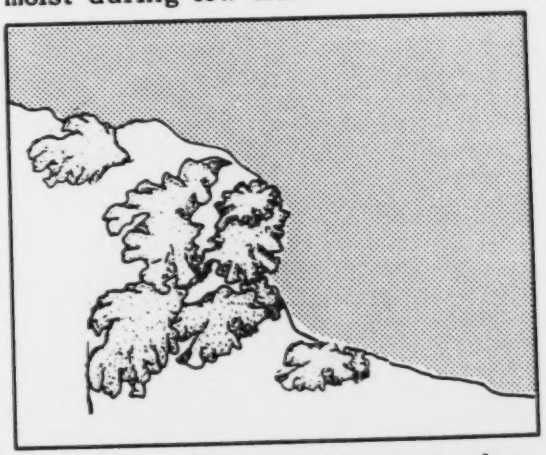
Background:

Of the several kinds of edible Alaskan seaweeds, three of the most easily collected are bull kelp (Nereocystis luetkeana) which is found southward from Unalaska Island in the Aleutians; and sea lettuce (Ulva or Monostroma) and rockweed (Fucus distichus), both of which may be found on most beaches in Alaska.



Bull kelp is a large brown seaweed that grows in relatively shallow water and is often washed up on beaches. Finger-like projections make up its holdfast. Above the holdfast grows a long stipe (or stem) that may be several feet long. Atop the stipe is a bulbous, gas-filled bladder with attached blades, or fronds. The bladder gives the plant flotation and enables it to keep the upper part of the plant near the water's surface.

Rockweed is the most common brown seaweed. Found attached to rocks throughout the middle intertidal zone, it has gas-filled bladders at the tip of each branch that help keep it floating near the surface when the tide is in, thus increasing the amount of light available for its energy needs. Rockweed secretes a mucus-like substance which helps keep it moist during low tide.



Sea lettuce is a bright green alga that grows in the low intertidal zone. It looks like limp lettuce leaves, is brilliant green and very thin.

Depending on when you plan to use the seaweeds in class, either collect algae from the beach before taking a class field trip to the shore, or, if you find a good supply of algae, bring some back from the class outing. To keep the algae in good condition until it is used, you may place it in the refrigerator in a plastic bag with moist paper towels for a few days. Algae may even be frozen and transported from coastal to interior communities in the state. Dried seaweed is sold in many grocery stores, particularly those with a good oriental selection.

Vocabulary:

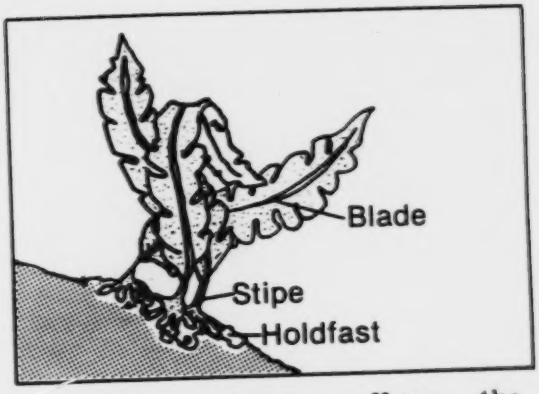
- frond
- blade
- stipe
- holdfast
- seaweed
- kelp
- lettuce

Materials:

- seaweed (including edible varieties)
- cooking utensils, pans, heat source
- spices, sweetener, soy sauce, rice
- recipes
- worksheets:
  - ...Holdfast (5A)
  - ...Bull Kelp (5B)
  - ...Matching (5C)
  - ...Bull Kelp Maze (5D)
  - ...Sea Lettuce (5E)
  - ...Color Code (5F)
  - ..."S" Seaweed (5G)

Procedure:

1. Bring seaweed into the classroom for students to smell and touch. Point out the different parts (holdfast, stipe, blade). Have the students hold their seaweed in an imaginary ocean and wave back and forth with the waves crashing in. Talk about how seaweed provides food for many animals (such as snails), and how they are good hiding places for fish.



2. Now let the students taste the seaweed! Pick one or more of these for your own recipes to try out. People of Asian origin and Alaskan Natives also have recipes which they may be willing to share.

Seaweed Rice

Crumble one of your local edible seaweeds such as fresh sea lettuce or dried seaweed from the grocery store in a pot of steaming hot rice and cook for several minutes. Serve with soy sauce.

Seaweed Crackers

Add tiny seaweed pieces and a little soy sauce to one of your favorite cracker recipes. These also can be purchased commercially.

Seaweed Salad

Shred edible seaweed and place in salad.

Kelp Relish or Pickles

Use stipes no longer than 15 feet and sections that are no more than three inches in diameter. Snap off a piece to test for freshness; if it breaks crisply, it will make good pickles. Chop off the bulb and "tail."

Pare kelp with a vegetable peeler and slice into thick rings. Rinse in cool water. Soak rings in cool water for three days, changing water two to three times a day. On the fourth day, place rings in cold water to cover. Bring to a boil and simmer 12-14 minutes. Drain and measure.

For each quart of rings bring to a boil and simmer together for five minutes:

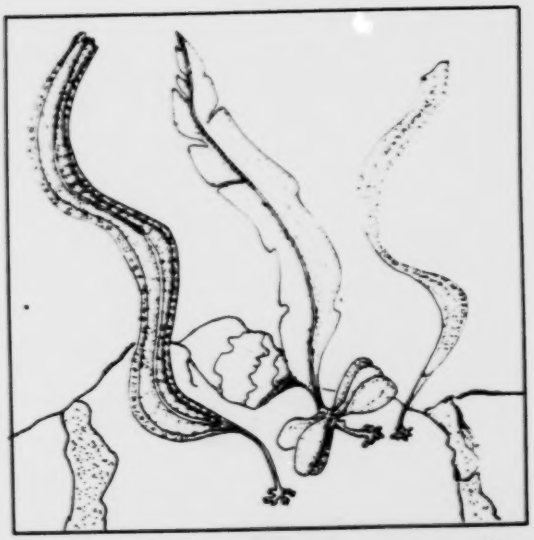
3/4 cup cider vinegar
2½ cups sugar
1 teaspoon mixed pickling spice
a few cloves

Pour above over rings and let stand overnight. Next day, drain off syrup, heat to boiling point and pour over rings. Let stand another night. Fill hot jars with kelp rings, cover with hot syrup and seal. Let stand a month before serving.

Krazy Kelp Kandies

2 cups bull kelp circles
vinegar
2 cups brown sugar
1/4 cup water
2 teaspoons ground cinnamon

Find a newly beached bull kelp whose stipe has the texture of a crisp, hard apple. Cut off about one foot of the stipe where the diameter is one or two inches. Store it in a moist plastic bag in a cool place.



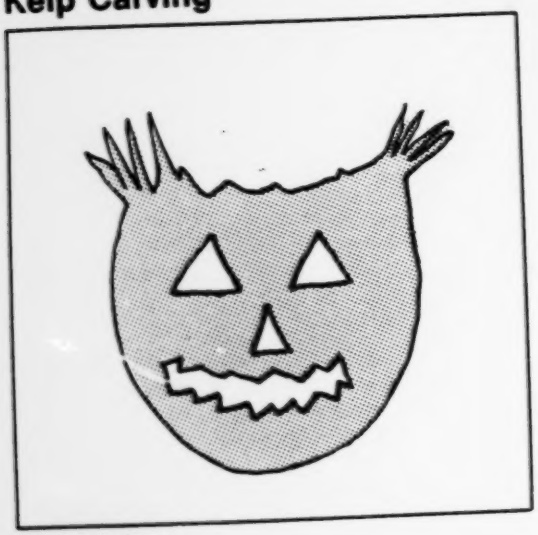
Back in the classroom, cut the stipe into quarter-inch "Life Saver" circles - enough to make 2 cups. Place pieces in a pan and cover with vinegar (do not use wine vinegar). Mix 2 cups kelp, 2 cups brown sugar, 1/4 cup water. Bring mixture to a boil, stirring until sugar dissolves. Add 2 teaspoons ground cinnamon, turn heat down and let mixture cook very slowly, uncovered for one hour.

Using a slotted spoon for fork, lift the kelp from the syrup, draining over the pan a few seconds, and place in a shallow pan with 1/4 inch brown sugar on the bottom. Using a fork, coat kelp with brown sugar and spread to dry and cool on a plate. You and your friends will enjoy krazy kelp kandies. Any remaining syrup may be used on pancakes, waffles, french toast, or over ice cream.

(adapted from Exploring the Olympic Seashore, S. Forrest Blau, National Park Service, 1976)

3. Use the seaweed worksheets as a followup to your taste treats.

Activity 2
Kelp Carving



Materials:

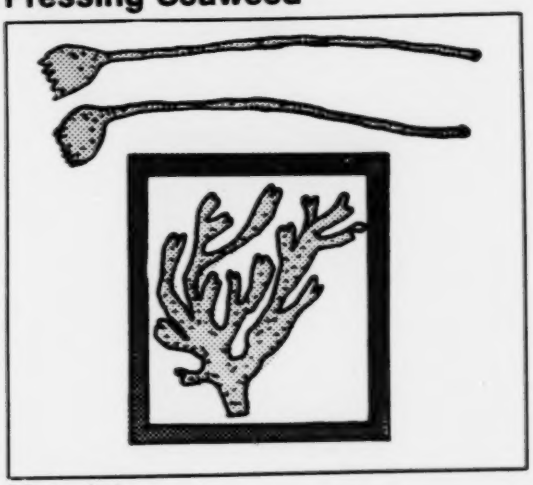
- bull kelp bladders
- blunt knives, sticks, broken shells, other implements for cutting

Procedure:

For a face, carve the kelp bladder just as you would a pumpkin. Experiment to make different faces and designs. Demonstrate carving to the students. Then if you have enough bladders, let students--either singly or working in pairs or groups--carve faces using blunt utensils.

For a horn, cut off one-half of the bulb and part of the stipe leaving the remaining half of the bulb attached to a length of stipe several feet long. Take a deep breath and blow into the stipe, keeping your lips tight as if blowing a trumpet. You can produce a mellow sound or even a tune if you practice enough.

Activity 3
Pressing Seaweed



Materials:

- small, delicate seaweeds
- bucket of sea water
- drawing paper
- shallow pan larger than sheets of paper
- paper towels
- cheesecloth or pieces of old sheet, diapers, muslin or waxed paper
- newspapers

Procedure:

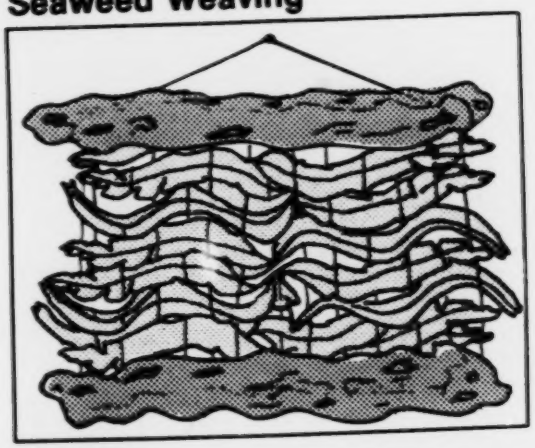
1. Collect algae from the beach and put it in a bucket or plastic bag of sea water (at least keep the seaweed cool and damp). Use as soon as possible after collecting.

2. Place a piece of drawing paper in the pan and cover with sea water or tap water. Float and arrange a piece of algae over the paper. Gently lift the paper from the water with the algae on top and do any final arranging. Cover with cheesecloth (Pieces of sheet, diapers, muslin or waxed paper often work better, since finely structured seaweed specimens tend to get caught in the large weave of cheesecloth.). Cover the cloth with newspapers, cardboard, more newspapers and finally with books. Let dry for several days. Change newspapers from time to time. Natural gelatins in the algae will cause them to stick to the paper, but if the alga is thick, you may need to glue it or spray with fixative after it has dried.

3. Alternatively, lightly dry the seaweed between paper towels and press between two sheets of clear contact paper or use your school's laminating machine.

4. When the seaweed is dry, make bookmarks, note paper, cards, placemats, or wall hangings. Or mount it on wood or other stiff material to make a plaque.

Activity 4
Seaweed Weaving



Materials:

- 2 large pieces of driftwood
- jute twine
- seaweed
- music
- paper and pencil

Procedure:

1. Wrap the two pieces of driftwood with jute and add an additional strand for hanging. Using seaweed you or the children have gathered, weave seaweed into the jute. Allow to air dry and hang.

2. Weave your own seaweed dance! Find a recording of sea music such as DeBussy's "The Sea." Play the record (part of it) for the students, letting them listen to it and imagine algae weaving rhythmically back and forth by the motion of the sea. Read the stanza by Robert Lewis Stevenson about seaweed:

   Ever drifting
   drifting
   drifting
   On the shifting current of the restless sea.

   Then, ask them to pretend they are algae and to move, either as if they were attached to the bottom of the sea or adrift at its surface. Make up your own seaweed dance.

3. As a class project or with individual students, have the student weave their own imaginary seaweed story, for instance one entitled:

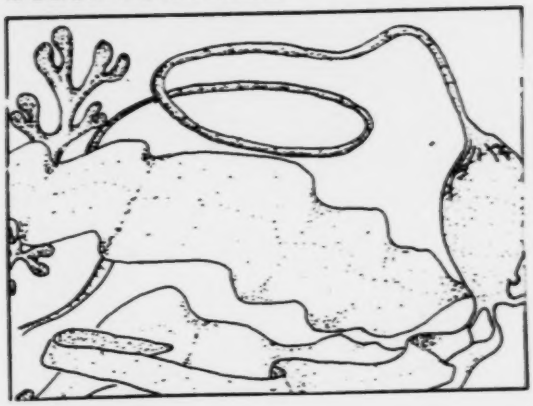
   The Adventures of a Floating Seaweed

   that begins:

   One day while adrift on the sea, I....

   Have the children illustrate the story and use what they have done to create individual books or perhaps a class mural.

Activity 5
Beach Seaweeds



Materials:

- small boxes or trays
- sand, pebbles, and other items found on a beach

Procedure:

1. Visit the beach. After students have had some initial exploration time, focus on seaweed (See Task Card).
2. Have the children make a beach in a box, including seaweed, sand, shells, driftwood and pebbles.
3. Summarize by talking about the importance of seaweed as food for many animals (including people!) and as places for fish and other small animals to live and hide.

Seaweed

Leader: Ask the children if they can find some seaweed. When they have, ask them:

- What colors are the seaweeds you found?
- How do they feel?
- How do they smell?

Ask the children questions about likenesses and differences of specimens collected:

- Which seaweed did you find in tide pools? On rocks? On shells?
- Where did they not grow?
- Can you find any animals living on seaweed? (Look closely among the blades and at the base of the holdfast.)
- Are seaweeds like land plants? (Seaweeds have "holdfasts" which are like roots, "stipes" which are like stems, and "blades" or "fronds" which are like leaves.)
- Can you find the blade, stipe and holdfast?
- Do seaweeds float? (Most don't, but the bladders on kelp and rockweed help those seaweeds to float.)

Seaweed Bibliography

Teacher's Reference:

Guberlet, M. L. Seaweeds at Ebb Tides. University of Washington Press, Seattle, 1956. 182 p.

Basic information about seaweeds accompanied by line drawings of some species.

Madlener, Judith C. The Sea Vegetable Cookbook and Field Guide. Woodbridge Press, Santa Barbara, CA, 1981. 154 p.

Excellent recipes and information on identifying the various species. Line drawings and some color.

McConnaughey, E. Sea Vegetable Recipes From the Oregon Coast. 1980. 32 p. McConnaughey Recipes, 1653 Fairmount Blvd., Eugene, Oregon 97403.

Tips on identifying, collecting, and drying seaweed for use in the kitchen. Includes nutritional values of seaweeds. Recipes for seaweed pizza, granola bread, soup, spaghetti, pickles, pie crust and more.

Waaland, J. R. Common Seaweeds of the Pacific Coast. Pacific Search Press, Seattle, Washington, 1977. 120 p.

Species descriptions with full page illustrations.

Unit Six
Birds of Wetlands, Rivers, and Seashores

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Worksheets:
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Eagle 6B
Gull Maze 6C
Duck.....6D
Geese 6E
Matching Birds.....6F
Bird Feet and Heads ...6G

Activity 2: Observing Birds .100

Birds Bibliography 101

Objectives:

To enable students to:

- Become familiar with the appearance and habitat of six Alaskan birds (Activity 1).
- Role play the different birds (Activity 1).
- Visit a local museum or the home of a bird expert to see live or mounted birds (Activity 1).
- Discuss the effects that man's presence has had on these birds (Activity 1).
- Observe birds at a beach, river or wetlands (Activity 2).
- Study bird tracks (Activity 2).
- Feed the birds (Activity 2).

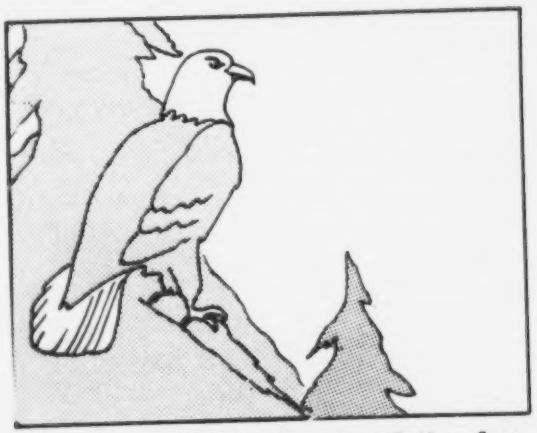
Birds. Clockwise, from upper left: glaucous-winged gull, Canada goose in flight, mallards in flight and afloat, Canada goose ashore, raven, crow, pintail (male, afloat), bald eagle, canvasback (male).

Many species of birds are found along Alaska's rivers, wetlands, and in coastal waters. Like all birds, they may be grouped by where they live, how they move, and how they feed. Scientists group birds according to their likenesses in appearance and activity: swimmers, tree perchers, predators, divers, insect eaters, seed eaters, probers, waders.

Eagles, gulls, ducks and geese are seen throughout Alaska. Crows are common in southeast and southcentral Alaska. These six groups all consist of relatively large birds that children easily learn to recognize:

CROWS. Only one crow specie occurs in southeast and southcentral Alaska. Called the northwest crow, it is smaller than the common crow of the fields and farms elsewhere in America, growing to a length of 17 inches. It is solid black, has a quick wing beat for so large a bird, and makes a loud "khaa" sound. Crows are most often seen in groups of a few to several hundred, and they often "work" the beaches, scavenging mussels, clams, crabs, and whatever other food they find. They often eat bird eggs, particularly seabird eggs when nesting seabirds are frightened away by humans or predators. Crows and ravens are intelligent. They are great imitators and are famous for the games they play with each other, and the tricks they play on people, dogs and cats.

RAVENS. Like crows, the common raven is black. It is, however, much larger than the northwest crow, growing to as much as 27 inches in length. The raven has a wedge-shaped tail, a bill heavier than the crow's, and shaggy throat feathers. Ravens are found all over the state. They fly by alternately flapping their wings, then gliding. Ravens usually are solitary or in pairs, never occurring in the large groups that characterize crows except at dumps and roosts. Ravens eat just about anything, including carcasses, bait from traplines, berries, bird eggs, insects, fish, crabs, clams and voles. The basic call of the raven is a cr-ruk - but raven sounds vary greatly, often imitating other birds, or calling in resonant, bell-like tones, or even sounding like a muttering human! The raven is extremely important in Tlingit traditions, in which he is believed to be the creator of the world. Many legends exist about his deeds. Other Native groups also have raven legends.

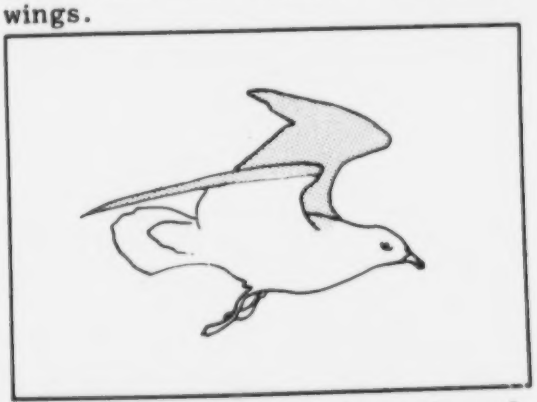


EAGLES. Alaska is one of the few places in the world where bald and golden eagles are still common. In southeast and southcentral Alaska, they are frequently seen along beaches and streams perched in tall evergreens, cottonwood trees or rocks from which they watch for spawned out salmon and other food.

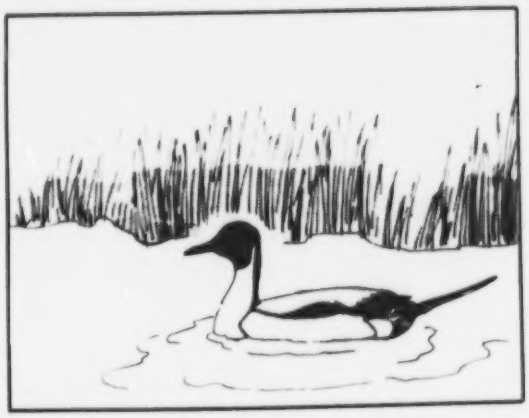
Bald eagles reach a length of as much as 43 inches and may have a wing spread of six to eight feet. Immature birds are mostly brown and have a dark bill. With maturity, these markings change gradually until the mature bird has a white head and tail and yellow bill and feet. Bald eagles have a call that could be described as a squeal or screech - not at all what might be expected from such a large, imposing bird. Their eyesight is extremely keen. They can see distinctly for far greater distances than we can. Bald eagles are capable of landing in the water to capture prey and then using their wings to scull to shore.

Golden eagles generally are found more in the Alaskan interior. The adult is a large, dark bronze bird with no white patches. The immature golden eagle has a white patch at the base of the tail and white wing patches. The golden neck feathers can be seen only at close range. The golden eagle's call is similar to the bald eagle's, but louder. They eat primarily voles and other small mammals. Golden eagles often are seen soaring in the air currents near the tops of mountains.

In flight, eagles stroke deeply, then soar on broad, flattened wings.

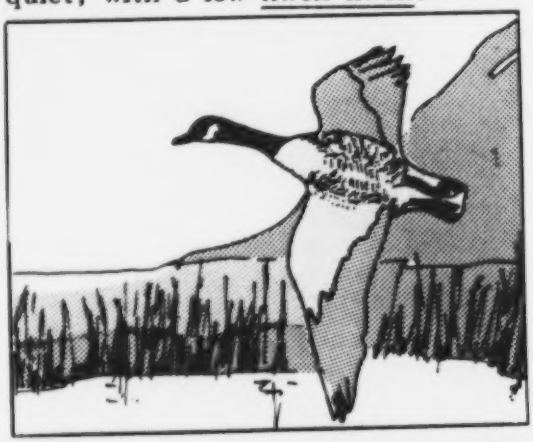


GULLS. A number of species of gulls may be found in Alaska. Of these, the glaucous-winged gull is the largest and most common, in southeast and southcentral Alaska. Immature birds are a dusky grey-brown and have dark bills. Mature glaucous-winged gulls are grey with white head, tail and breast, and have a yellow bill. Glaucous gulls look very similar and are the most common gull in Western Alaska. These gulls feed on small fish they catch by diving at them when they show at the water's surface; but they also will harass diving ducks to cause them to drop food they have taken or they will scavenge along beaches for any edible materials. The somewhat smaller mew gulls are found in the Interior. They have a mewing call, and wingtips that are black with white spots at the outer edge. In contrast to the mew gull, most gulls are known for their loud, raucous screams.



DUCKS. There are two main types of ducks: dabbling ducks and diving or bay ducks. The dabbling ducks take off directly out of the water just like helicopter pilots. Diving ducks have to run along the water like fixed-wing planes as they take off. Diving ducks dive and swim under water to get their food (fish, clams and other small invertebrates). Dabbling ducks just tip up to graze on pondweeds or pond invertebrates. Mallards, pintails, teal, and widgeon are samples of these shallow water ducks. The divers--such as oldsquaws, scotors, eiders, and harlequin, generally are found in deeper waters.

The mallard, which is the duck portrayed on this unit's Duck worksheet, is the best known American duck. The male mallard has a green head with a white collar; a yellow bill, orange feet, purple-blue wing patch, a grayish body, chestnut breast, and a white tail with an upcurled black tip. The female is mottled brown with a whitish tail, violet-blue wing patch, dark orangish bill and orange feet. As is the case with many other birds, the female mallard is less colorful than the male - a characteristic that enables her to blend with her surroundings. Thus she is less obvious to predators, which is especially important during nesting season. The female mallard call is a loud quack, quack-quack; quack, quack-quack. Males are more quiet, with a low kwek-kwek.



GEESE. Geese do not normally land on open salt water, preferring freshwater wetlands, though some species use salt water during migration or winter feeding. In spring or fall they often may be seen flying overhead. Some areas in Southeast Alaska, such as Juneau, have resident populations of Canada geese so that these birds may be seen year round. Canada geese (which appear on this unit's Geese worksheet) are distinctively marked, being generally grey-brown, but with a black head and neck and white cheeks. The Canada Goose is found all over Alaska. It eats primarily grasses and seeds. Geese in the air follow a leader but because of air turbulance can not fly directly behind in single file but must string out V-shaped on either side of the leader like military planes. Groups of migratory swans may sometimes be seen overhead as well. Such birds can be distinguished from Canada geese by their white color, greater individual size and by their call, which generally is softer than the honking of the Canada geese.

Activity 1
Common Alaskan Birds

Vocabulary:

- body
- bill
- feet
- wing
- raven
- crow
- gull
- goose
- duck
- eagle

Materials:

- films, slides, pictures, drawings of the birds
- slips of paper (enough for each of the children) with the different types of birds (one each) printed or drawn on them.
- local museum or home of bird expert
- worksheets:
  - ...Raven and Crow (6A)
  - ...Eagle (6B)
  - ...Gull Maze (6C)
  - ...Duck (6D)
  - ...Geese (6E)
  - ...Match Birds (6F)
  - ...Bird Feet and Heads (6G)

Procedure:

1. Discuss what the children think ravens, crows, eagles, ducks, gulls, and geese might eat. Use the bird worksheets. Build upon their own knowledge and experiences. Discuss how the bill and feet of each of these birds is fitted to its way of living and feeding. As much as possible, let the children work out the connections.

2. Now pass out the slips of paper. Have the children role play the different birds. Honk, squawk, and quack.

3. Visit the local museums or the home of a bird expert to see live or mounted birds. Have students watch how they move and eat. Listen to the sounds they make. If possible let them touch the bird or feathers. Try to have enough feathers so that each child may take one home.

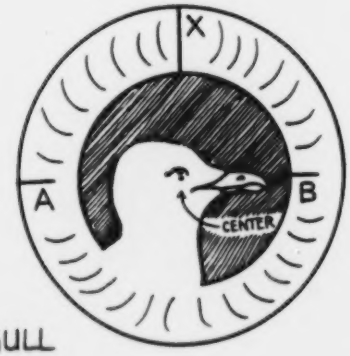
4. Discuss the way in which gulls, eagles, crows, and ravens help keep our earth clean. Be sure that children know that these birds are protected by law and cannot be killed. Tell the students local stories or legends. Discuss the effect that man's presence has had on these six common birds, whether it has been good or bad and in what ways. (Gull, crow and raven populations have increased tremendously because of all the garbage we produce. Eagles in the Lower 48 have been dying out because their eggs don't hatch because of chemicals (poisons) used on crops to kill insects. Poisoned insects and chemicals

in water contaminate fish, which in turn contaminate eagles. Numbers of ducks and geese have been reduced primarily because of the loss of their homes (draining of wetlands) in the Lower 48.)

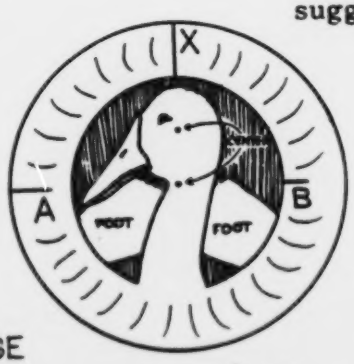
Additional Activities:

1. Language Arts: Have each child dictate a short "event" concerning birds for a language experience chart or for a bird book to take home.

2. Art: Create a flock of gulls or geese using the following directions from the December 1977 issue of Sunset magazine: Gull - Transfer two circles to paper plate. Draw in eye just above center point. Add beak and neck and cut along solid black lines. Discard light gray area. Goose - Transfer two circles to plate around centers shown. Draw in beak and eye; cut along solid black lines. Discard gray areas. Color beak and pieces marked "foot" a bright orange, then glue feet to inside of body. Cut along lines A, B and X. Assemble by inserting slot A into slot B.



GULL



GOOSE

3. Just for fun, read aloud to students one or more of the stories or poems about birds listed in the bibliography. And share the following poem:

Ducks' Ditty

All along the backwater,
Through the rushes tall,
Ducks are a-dabbling,
Up tails all!

Ducks' tails, drakes' tails,
Yellow feet a-quiver,
Yellow bills all out of sight
Busy in the river!

Slushy green undergrowth
Where the roach swim--
Here we keep our larder,
Cool and full and dim.

Everyone for what he likes!
We like to be
Heads down, tails up,
Dabbling free!

High in the blue above
Swifts whirl and call--
We are down a-dabbling
Up tails all! --Kenneth Grahame

4. Art: Make a bird collage by cutting pictures of birds from magazines and glueing them to cardboard or pinning them to a bulletin board, making each picture touch others. Add feathers, pieces of egg shell, and whatever else imagination suggests.

Activity 2
Observing Birds

Materials:

- spotting scope (optional)
- bread crumbs, seeds, food scraps, gnet
- bird feeder

Procedure:

1. Go to a wetland, river, or beach to watch for birds. Spotting scopes can be focused on particular birds so that everyone gets a look. Take along a local birdwatcher. High tide is often the best time to go birdwatching on the coast, as the birds are closer to the upper beach then. As the children watch, ask them what the birds are doing, how they fly and rest, and what they appear to be eating.

2. If you can convince children to sit very, very still, scatter old bread, meat or fish scraps at the edge of the water. Watch to see what birds come to the food. Be sure to watch and discuss the behavior of the birds toward each other in the presence of the food. Do birds of the same species interact with each other? How? How do birds of different species react to each other?

3. Help the children find bird tracks on the sand or mud. Observe the size of the tracks and whether or not they are webbed. See if the class can figure out what kind of bird might have made the tracks and what it might have been doing.

4. The easiest place to feed and watch birds is at school. Set a bird feeder outside your classroom window. Experiment with different foods to attract a variety of birds. Once you start feeding, continue all winter, because some birds that become dependent on your feeder might otherwise starve. Record your class's observations regularly, preferably every day. Perhaps the children can take turns watching and recording.

Birds of Wetlands, Rivers, and Seashores Bibliography

Children's Literature:

Andersen, Hans Christian. The Ugly Duckling. Contained in many collections and separate editions, including a Golden Book edition, collected works of Hans Christian Andersen, and a 32-page translation by R.P. Keigwin, illustrated by Toma Bogdanovic. Scroll Press, N.Y., 1971.

The familiar tale about a duckling scorned by all until he discovers after a lonely winter that he has turned into a beautiful swan.

Baskin, Leonard. Hosie's Aviary. The Viking Press, New York, 1979.

Whimsical verse and beautiful watercolor bird illustrations that captivate audiences young and old.

Crosby, Alexander L. Canada Geese. Garrard Publishing Co., Champagin, Illinois, 1966. 64 p.

A Junior Science Book that tells the life story of Canada Geese including courtship, mating patterns and life cycle. A factual account of the experiences the author has had with the geese which lived at his pond for six weeks. The book devotes itself to the need for conservation and preservation of geese. Black and white photographs from various sources.

Flack, Marjorie. The Story About Ping. Viking Press, New York, 1961.

The adventures of Ping the duck are classic.

Freschet, Berniece. The Flight of the Snow Goose. Illustrated by Jo Polseno. Crown Publishers, Inc., New York, 1970. 42 p.

Discusses the annual migration of a flock of snow geese from the Sacramento Valley to and from Alaska, following the leader of the flock, Gander, and his family. Describes the passage of the seasons, various dangers encountered by the geese during their migration: hunters, oil slicks and blizzards. Pictures are charcoal black and white.

Gans, Roma. Birds at Night. Illustrated by Aliki. Thomas Y. Crowell Co., New York, 1968. 34 p.

Let's Read and Find Out Science Book on how much birds eat, where they sleep, how they retain heat. Illustrations are in black, white, green and brown with details in ink.

Garelick, May. What's Inside? Scott, Foresman and Co., New York, 1965.

Photographic series of a young goose from egg through early life.

Goldin, Augusta. Ducks Don't Get Wet. Illustrated by Leonard Kessler. Thomas Y. Crowell, New York, 1965. 34 p.

A Let's Read and Find Out Science Book about duck preening and eating habits. Excellent hands-on experiments are provided in the text, and elementary analogies illustrate diving ability, migration and speed of flight. Illustrations are in color.

Hawkinson, Lucy. Birds in the Sky. Illustrated by John Hawkinson. Childrens Press, Chicago, 1965. 32 p.

Highly recommend picture story book on the excitement of bird watching. Descriptive phrases: "Gulls that wheel and dip"..."Ducks are swift and sure. They beat their wings fast as they rise and turn." Beautiful watercolor illustrations.

Hoff, Syd. Albert the Albatross. Harper and Row, Evanston. 31 p.

About a sea bird blown inland by a storm.

Hutchins, Ross E. The Last Trumpeters. Illustrated by Jerome P. Connolly. Rand McNally and Company, 1967. 64 p.

Factual portrayal of the migration of the Trumpeter swan from North Carolina, California, Mississippi valley and Gulf coast to and from the Arctic Ocean. Details nest building, preening, egg laying, rearing of young. Beautiful pastel watercolors with ink.

Martin, Lynne. Puffin: Bird of the Open Seas. Illustration by Ted Lewin. William Morrow and Co., New York, 1976. 96 p.

Facts about the puffin are recounted in detail, and the various subspecies of the auk family are separated for purposes of identification and discussion. The accent is on man's relationship to the bird. Illustrations are charcoal and black watercolor.

McClung, Robert M. Honker: The Story of a Wild Goose. Illustrations by Bob Hines. William Morrow and Co., New York, 1965. 64 p.

Covers one year in the life of Honker, the leader of a flock of Canada geese, stressing the importance of refuges, banding and tracking. Illustrations are black and white and charcoal.

Parnall, Peter. A Dog's Book of Birds. Illustrated by Peter Parnall. Charles Scribner's Sons, New York, 1977. 43 p.

Picture-story book with a light and humorous account of a dog's encounters with birds such as the blue heron, pelican and albatross. Factual information is blended with fantasy in this extremely enjoyable book. Illustrations are in detailed ink.

Puccinelli, Marie. The Time of the Puffins. Illustrations by John Kaufman. Bobbs-Merrill Co., Indianapolis, 1965. 35 p.

Delightful, informational book about the mysterious and unusual habits of the puffin. Similar to Puffin: Bird of the Open Seas (Martin), but brings the audience into the material.

Selsam, Millicent. Tony's Birds. Harper and Row, New York, 1961. 64 p.

A Science and I Can Read book about how a boy begins to observe and learn about birds.

Toye, William. The Loon's Necklace. Oxford University Press, New York, 1977. 24 p.

A Tsimishian Indian legend of how the loon helps a blind man and receives his necklace. Watch for the film by the same name in your state and local film libraries.

Turkle, Brinton. Thy Friend, Obadiah. The Viking Press, N.Y., 1969.

A good old-fashioned story about Obadiah, a Quaker boy, and a sea gull.

Wildsmith, Brian. The Little Wood Duck. Franklin Watts, Inc., N.Y., 1973. 31 p.

Though wood ducks are not found in Alaska, helps students conceptualize the duck's environment and natural enemies. Beautifully illustrated with bright and cheerful water colors.

Wright, Dare. Look at a Gull. Random House, N.Y., 1967. 41 p.

A photographic essay on the hatching and growth of a sea gull.

Teacher's Reference:

Alaska Department of Fish and Game Nongame Wildlife Program: Alaska Wildlife Watcher Reports, Winter Birdfeeding in Alaska, Landscaping for Wildlife in Alaska, Birdhouses for Alaska. ADF&G Nongame Wildlife Program, 333 Raspberry Road, Anchorage, AK 99502.

Helpful pamphlets at no cost.

Angell, Tony. Marine Birds and Mammals of Puget Sound. Drawings by Tony Angell. Washington Sea Grant publication, University of Washington Press, 1982. 160 p. Available by writing University of Washington Press, Seattle, WA 98105.

The Alaska Fisherman's Journal says, "This book is worth the price for Tony Angell's drawings alone - and there is much more...Descriptions of

the various species - grebes, gulls, terns, seals, sea lions, dolphins, whales - are detailed succinct and sometimes written with passion." All birds and mammals featured are found in Alaska. Stunningly illustrated. Includes maps, tables, bibliography.

Armstrong, R. H. A Guide to the Birds of Alaska. Alaska Northwest Publishing, Anchorage, 1980. 309 p.

Species descriptions and range information on Alaskan birds. Color photographs.

Bellrose, Frank. Ducks, Geese and Swans of North America. Stackpole Books, Harrisburg, Penn., 1976. 544 p.

Detailed descriptions of waterfowl and their habits. Includes range information and full page maps of migration routes for each species. Color plates of adults and young.

Darling, Louis. Greenhead. William Morrow and Co., New York, 1954. 95 p.

The saga of Greenhead, a male mallard duck explores duck migration, natural enemies, and how man has upset the balance of nature. The text is complicated by an abundance of biological terms but everything mentioned is illustrated in detail in shades of black and white.

Darling, Louis. The Gull's Way. William Morrow and Co., New York, 1965. 95 p. (Also listed in Children's Literature Section of Sea Week Book 4.)

Personal observations on gulls over a six-week period. Provides detailed descriptions of the island where Louis Darling set up his tent, the rituals involved in courtship and the patterns long-established with nest-building, parent-chick relationships. Black and white and color photographs, and charcoal and pen drawings.

Eimerl, Sarel. Gulls. Simon and Schuster, New York, 1969. 61 p.

A lively account of the behavior and characteristics of gulls. Factual information about their scavenging nature. About 40 gulls are identified. Provides an excellent discussion of instincts. The lighter side is also presented so that the audience does not tire of data. Illustrated by black and white photographs.

Hancock, David. Adventure with Eagles. The Wildlife Conservation Center, Saanichton, B.C., Canada, 1970. 40 p.

The travels of David Hancock (a biologist) and his wife through British Columbia covering eagles, their nesting grounds, habits and other animals in their environment (puffin, sea lion and killer whale). Touches upon conservation and preservation in terms of damage incurred by biocides (pesticides/herbicides, etc.) and disturbance by humans. Black and white photography provided by David and Lyn Hancock. Some sketches.

Hicks, J. L. A Closer Look at Birds. Illustrated by John Rignall. Franklin Watts (Archon Press Ltd.), New York, 1976. 31 p.

Profusely illustrated information about a variety of birds. Describes the parts of a bird, flying, plummage, nesting, hatching, evolution, and migration. Alaskan birds mentioned include puffin (flying); eagle and albatross (ways of flying); blue heron and ducks (different feet); plovers and ducks (colors to blend); herring gull (eggs and hatching), and arctic terns and cranes (migration).

Hines, B. Ducks at a Distance. USDI Fish and Wildlife Service, U.S. Government Printing Office, Washington, D.C. 20402, 1978.

Handy field identification guide distributed by the U.S. Department of the Interior. Good color illustrations. When ordering, specify Stock No. 024-010-00442-8.

Murie, E. The Alaskan Bird Sketches of Olaus Murie. Alaska Northwest Publishing Co., Anchorage, 1979. 57 p.

Excerpts from field notes and superb watercolor of Olaus Murie, a naturalist who traveled extensively throughout Alaska in the 1920s and 1930s.

Peterson, R. I. A Field Guide to Western Birds. Houghton Mifflin Company, Boston, 1961. 366 p. Paperback and hard cover.

Descriptions of birds, their habits, habitats and field marks. Illustrated by color and black and white plates. One of the Peterson Field Guide series.

Putnam, Alice. The Whistling Swans. Illustrations by Scott Hiestand. Julian Messner, New York, 1981. 56 p. (Also listed in the children's literature section of Sea Week Book 4.)

Poignantly details the life cycle of the whistling swan from birth, through migration, and death. Begins with the swans spending the summer in Alaska, then migrating south to the Pacific coast, Mississippi River valley and Atlantic coast, and ultimately returning to Alaska the following summer. Obstacles include encounters with its natural enemies, man and inclement weather, as well as oil slicks and polluted water. Pen and ink illustrations.

Ripper, Charles L. Diving Birds. Illustrated by Charles L. Ripper. William Morrow and Co., N.Y., 1967. 64 p.

Detailed information on diving birds and particular characteristics of the loons, grebes, cormorants and anhinga. Touches on bird evolution and the uses of cormorants for centuries by Chinese and Japanese fishermen. Pen and ink illustrations.

Robbins, C. S. Birds of North America. Golden Press, New York, 1966. 340 p. Paperback and hard cover.

Descriptions of birds and their habits, songs and ranges - illustrated by color drawings. Easy to use in the field but not as much background information as the Peterson Field Guide.

Scott, Jack Denton. Canada Geese. G.P. Putnam's Sons, New York, 1976. 64 p.

Great attention is given each aspect of goose lives: selection of a mate; birth and caring for the young, and death. Man's intervention in nature is portrayed as one of helping maintain the balance. A table of "goose talk" is provided. Illustrated with black and white photographs.

Wheeler, Ruth Lellah. The Story of Birds of North America. Illustrations by Anne Lewis. Harvey House, Inc., New York, 1965. 128 p.

Includes chapters on structure, mystery of a feather, bills, feet, nests. The material is somewhat "dry" but factual. Charcoal and pen drawings.

Charts and Records:

Common Bird Songs, Songs of Western Birds and Bird Song and Bird Behavior. Produced by Donald J. Borror. Dover Publications, Inc., 180 Varick Street, New York, N.Y. 10014.

One after another songs of the various species.

Voices of the Loon. Written and produced by William F. Barklow. Published by the North American Loon Fund, Meredith, N.H. 03253 and the National Audubon Society, 950 Third Avenue, New York, N.Y. 10022

Various calls of the common loon together with commentary.

A Field Guide to Western Bird Songs. Produced by Roger Tory Peterson. Houghton-Mifflin Company, Boston. Two-record set.

Bird songs of more than 500 species, including most Alaskan birds. Also available from Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, N.Y. 14850.

A Host of Seabirds, Alaska. by Bob Hines, United States Fish and Wildlife Service. Available from U.S. Government Printing Office, Washington, D.C.

Set of six small color posters depicting Alaska's marine birds.

Alaskan Bird Chart and A Guide to the Audubon Alaska Birds Chart. Alaskan Audubon Society, 1976.

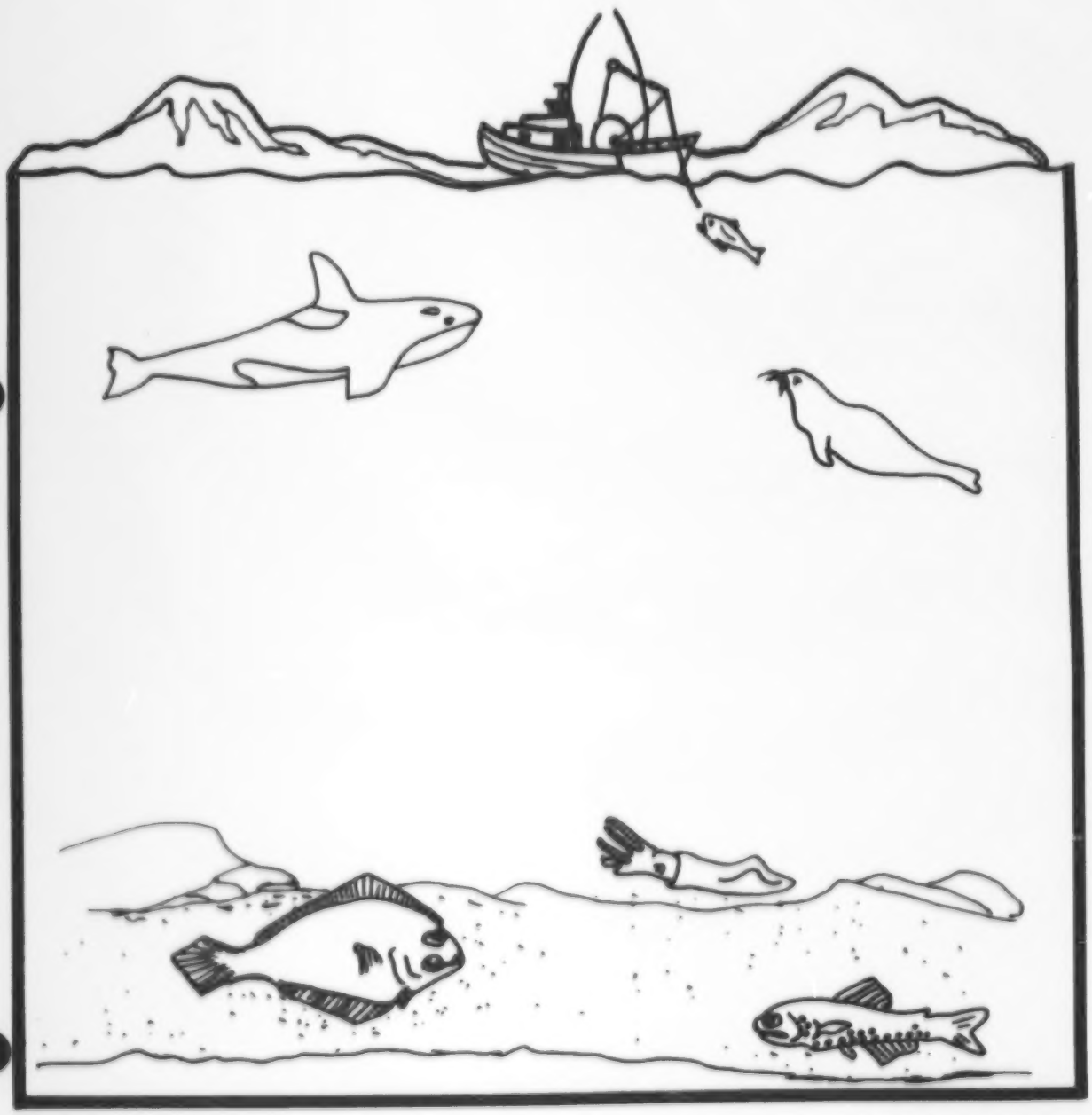
A large poster with color photos of many Alaskan birds and information on each species plus a map of migration routes. The guide contains activity ideas and easy-to-read bird information.

Activity Book

For Kindergarten
Sea Week

1-A

BOTTOM OF THE OCEAN



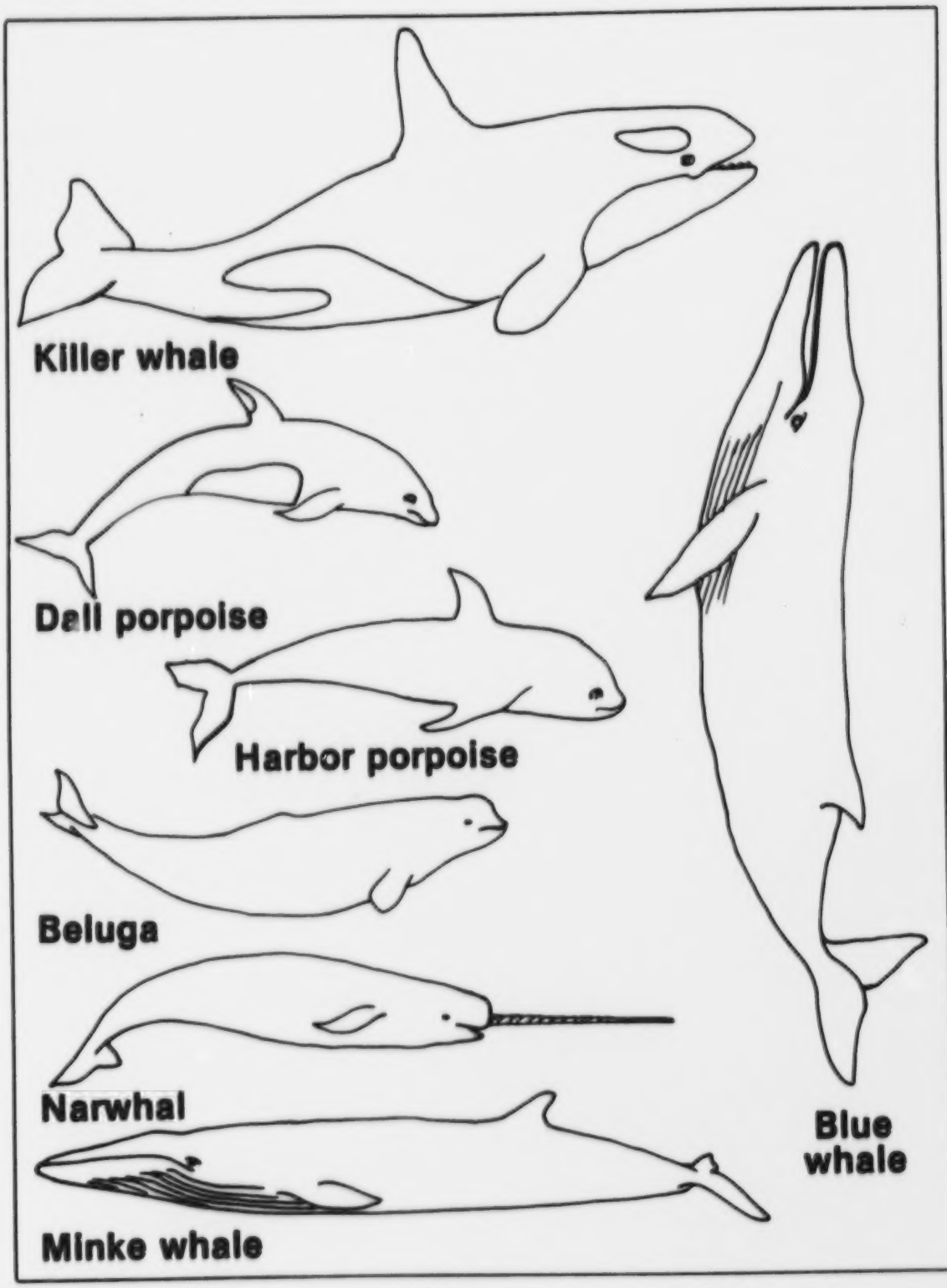
Tide

2-A

Wetland marsh

Wetland tundra

3-A

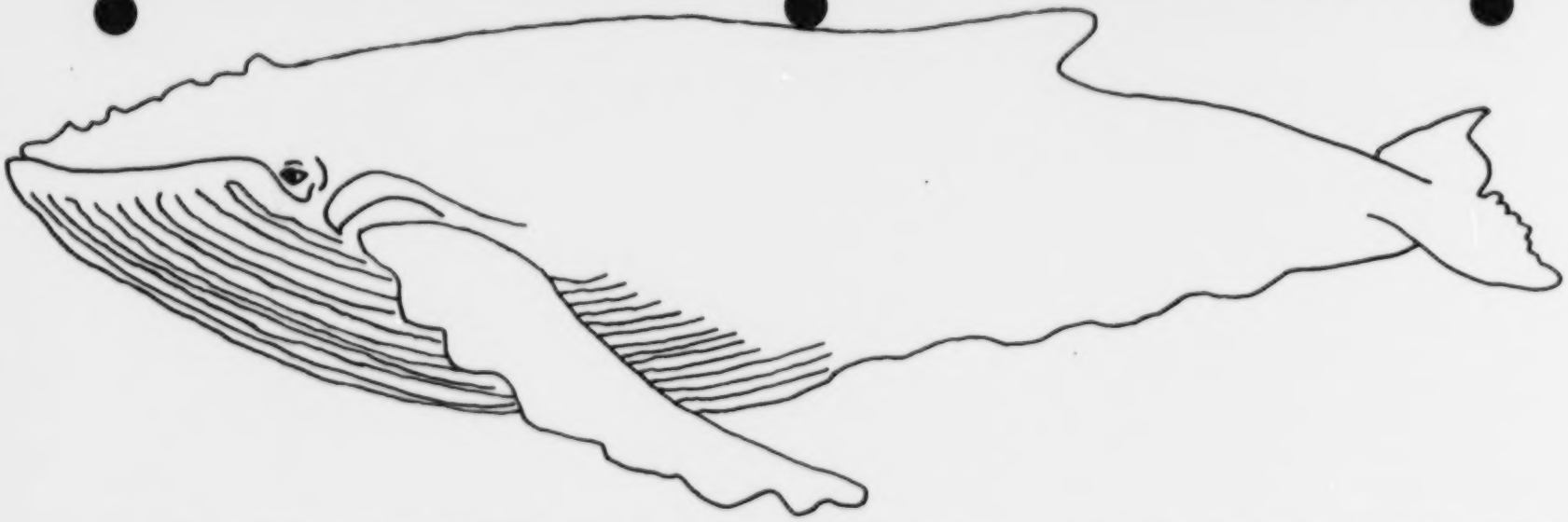

Killer whale
Dall porpoise
Harbor porpoise
Beluga
Narwhal
Minke whale
Blue whale

Bowhead whale

Sperm whale

Gray whale

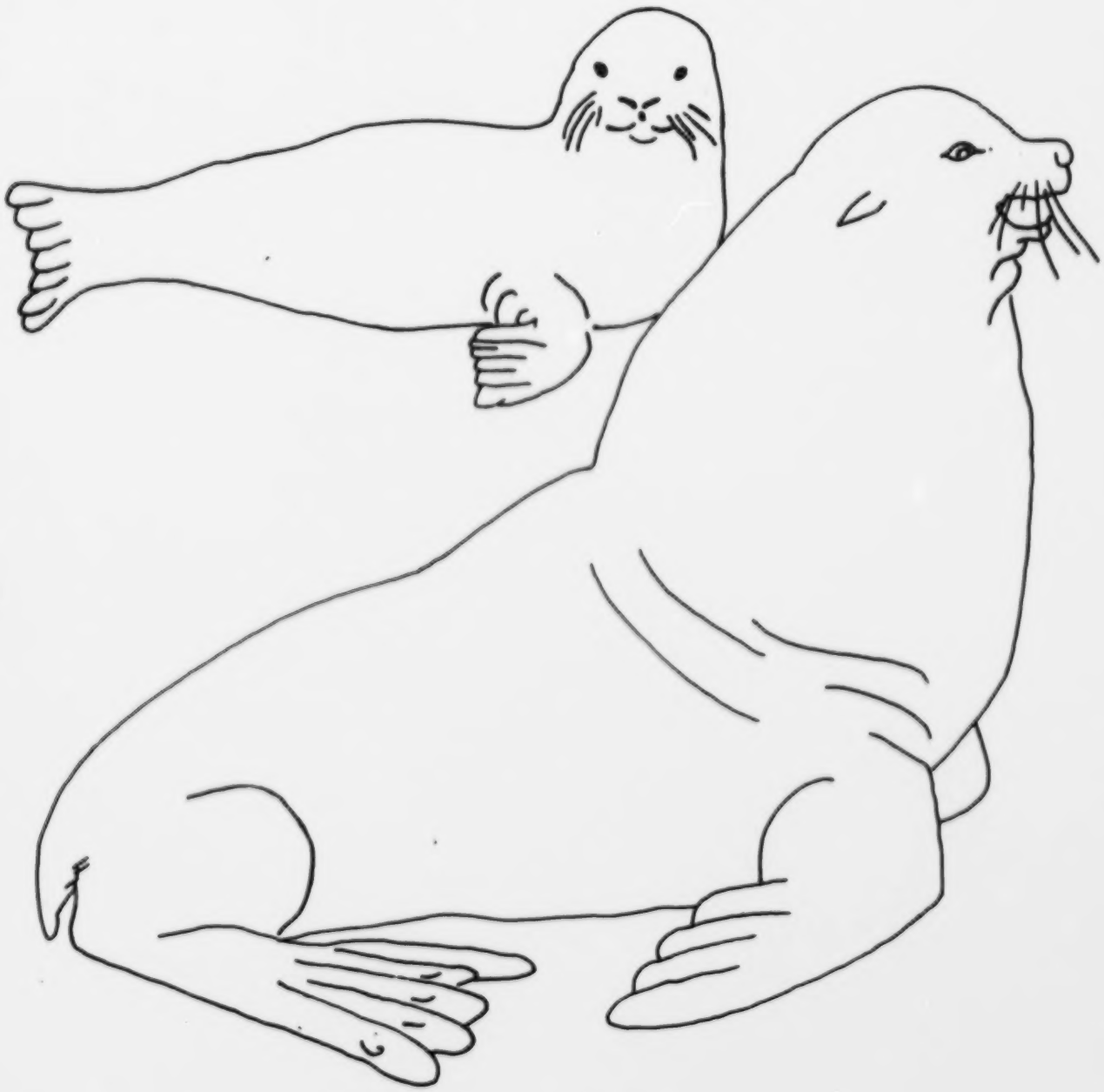
Humpback whale



Humpback whale

Killer whale

Seal

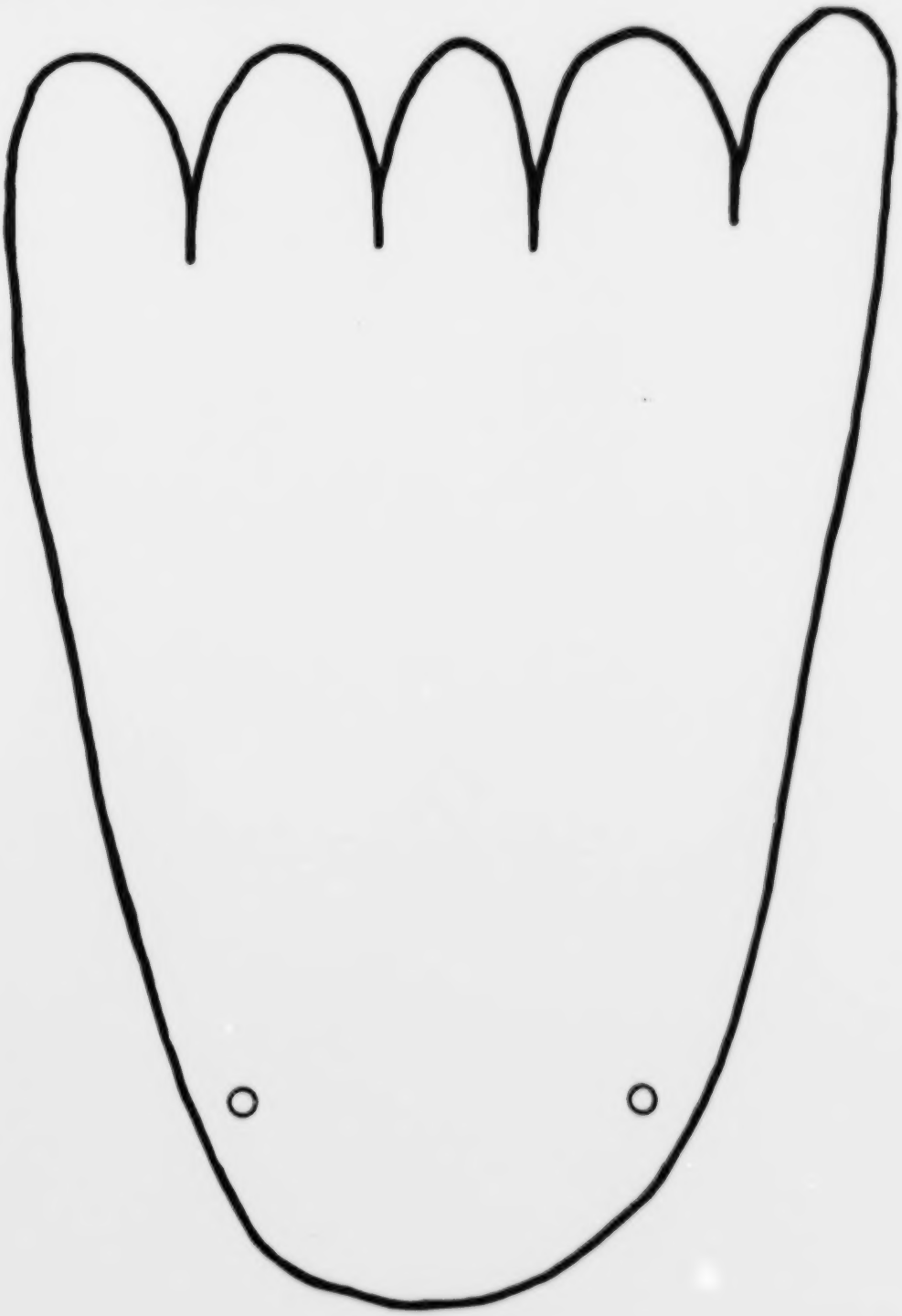


Sea lion

Seal Face Pattern

SEA LION
(same outline—add ears, longer whiskers)

Seal Flipper Pattern

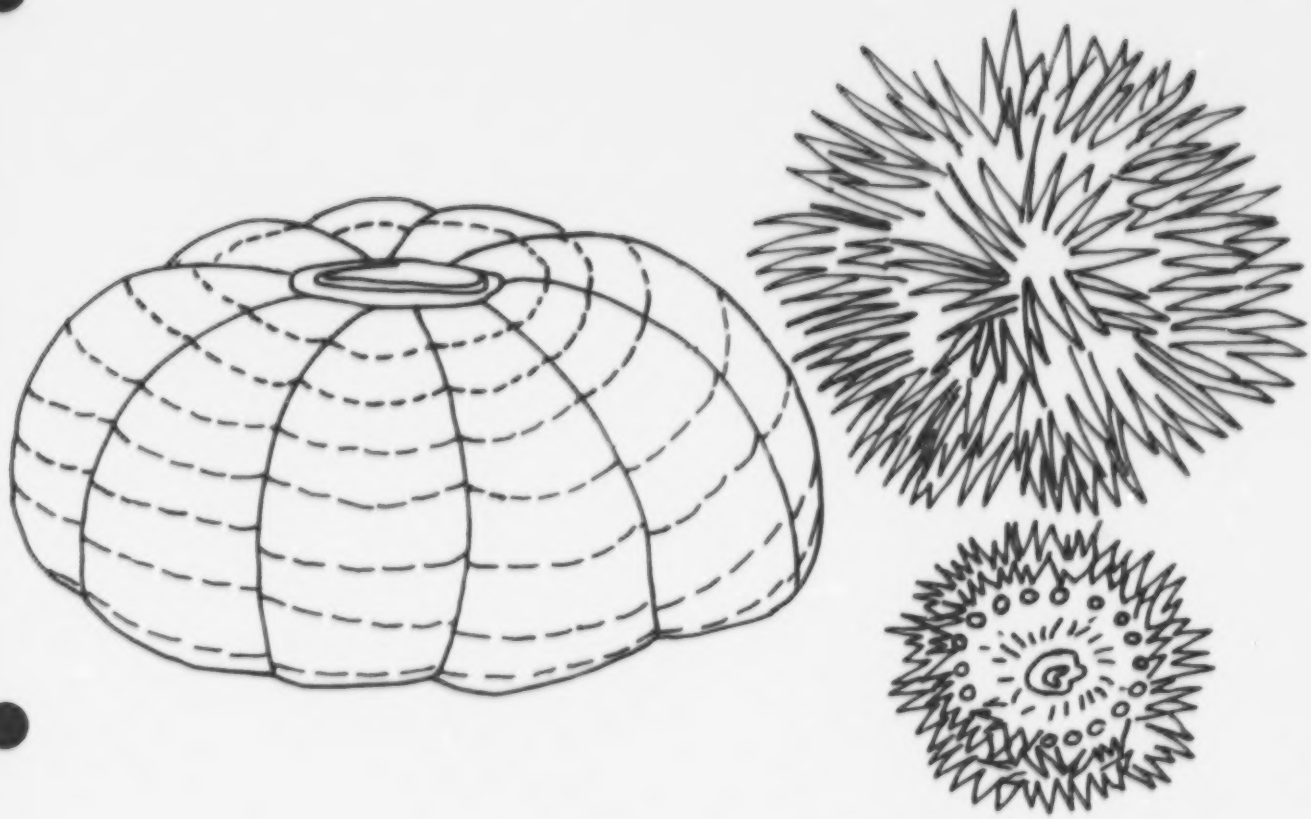


3-E

Sea Otter

HOW MANY CLAMS DID THE SEA OTTER EAT?

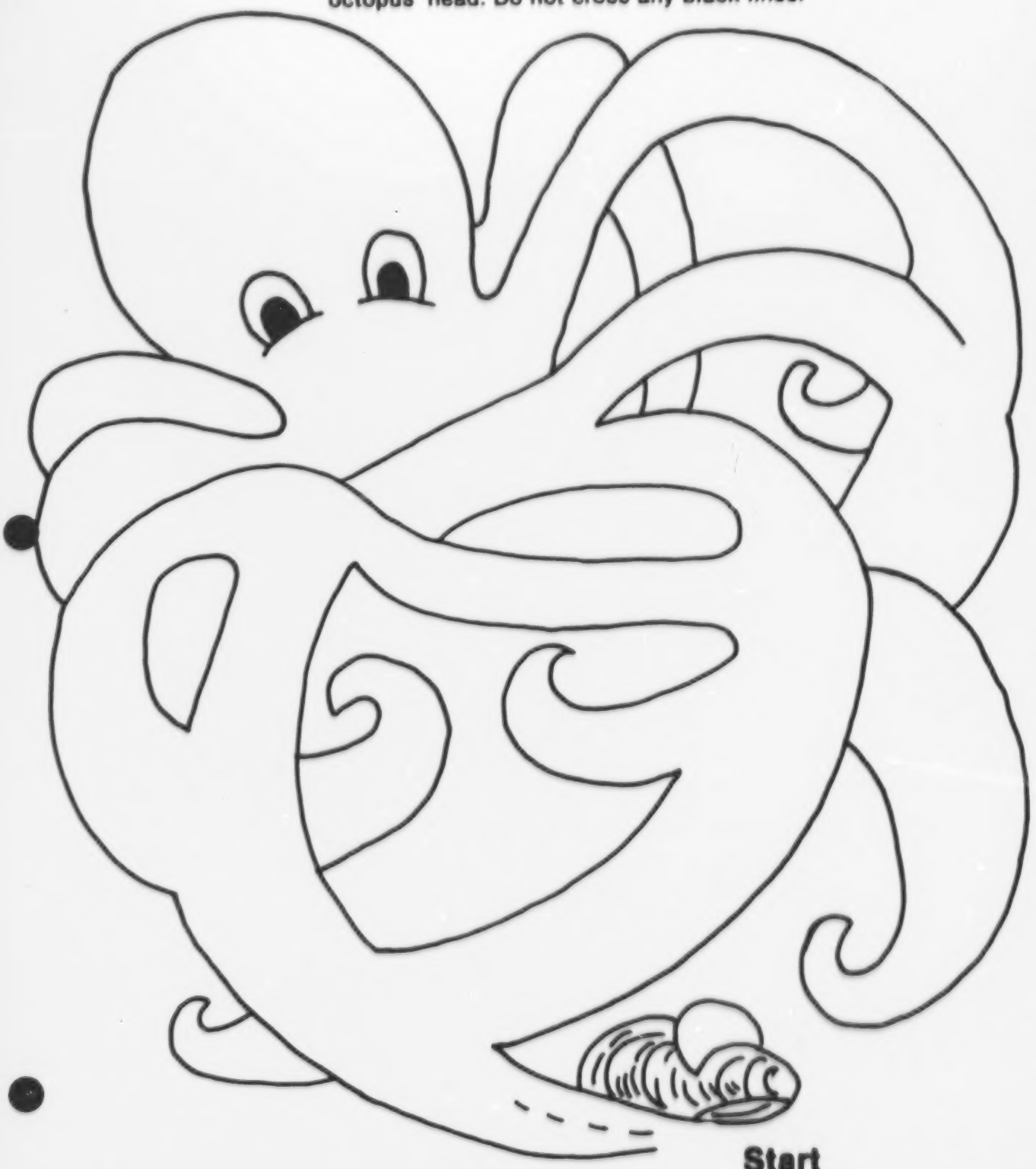
Sea Star



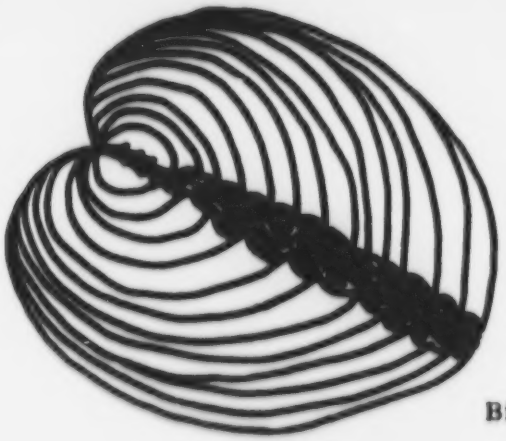
Sea urchin

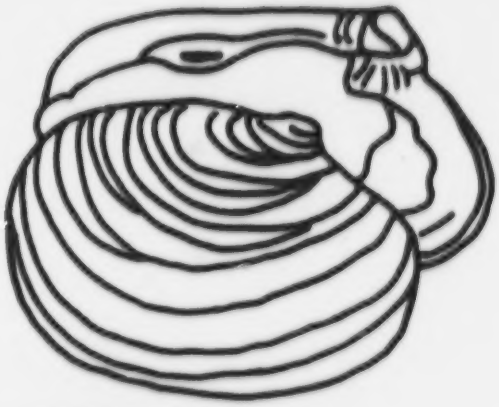
Feed the Octopus!

Directions: Make a line from the mussel shell to the octopus' head. Do not cross any black lines.

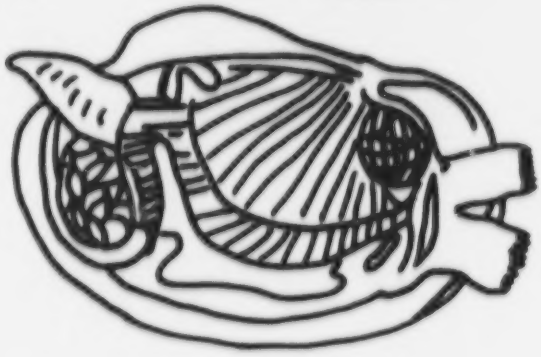


4-D

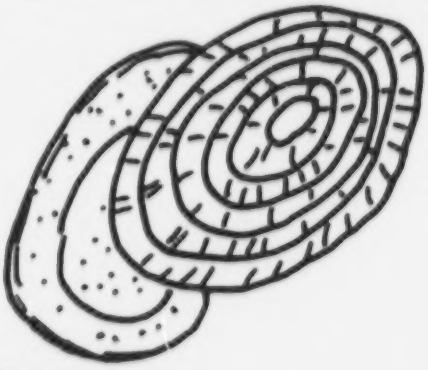




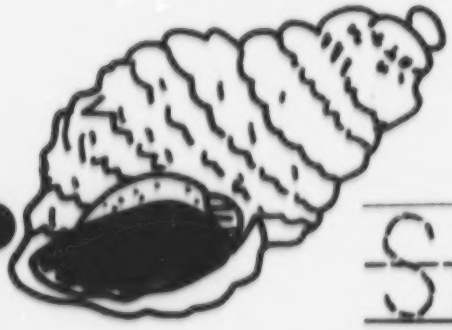
Bivalves



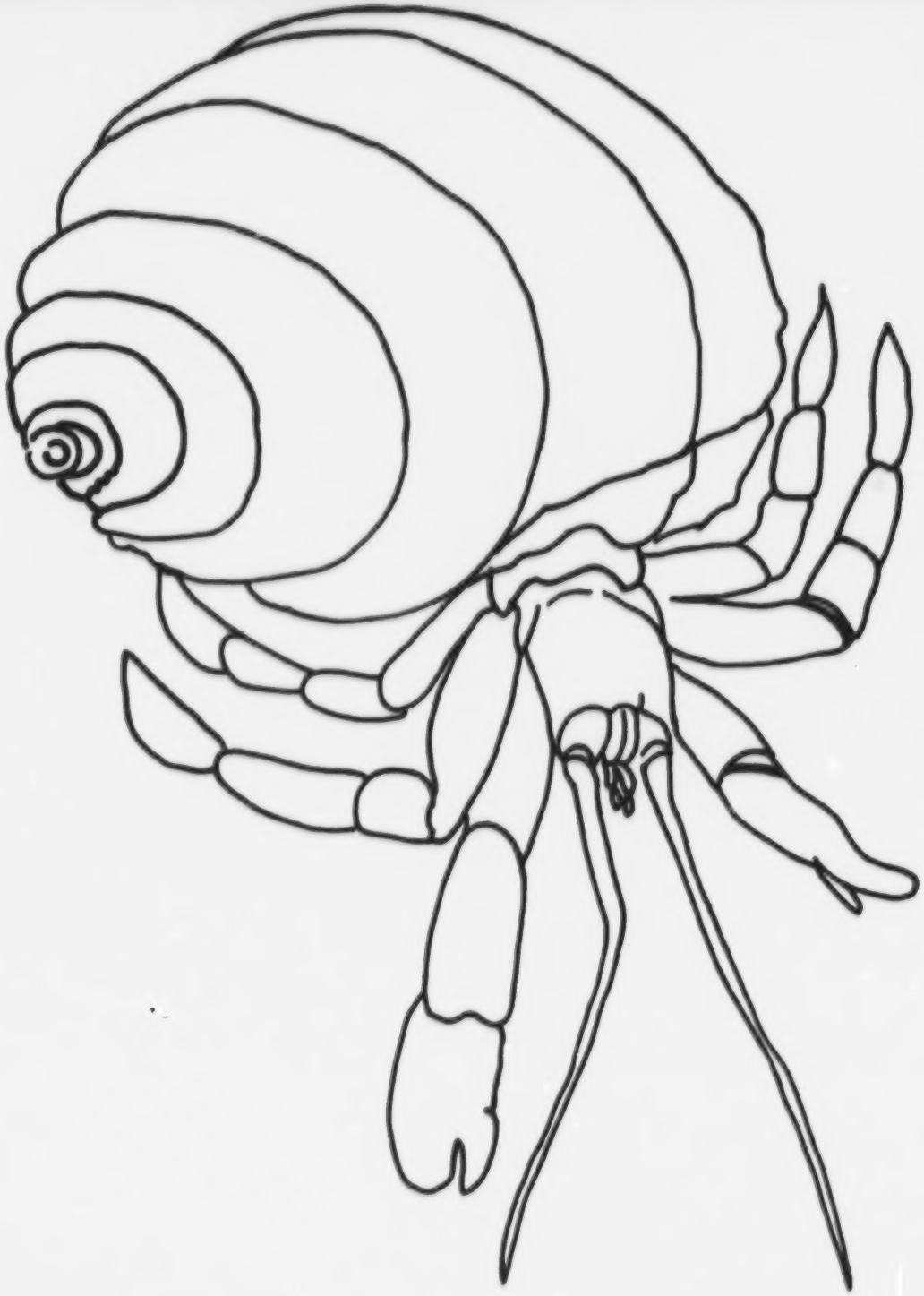
Clams



Univalves



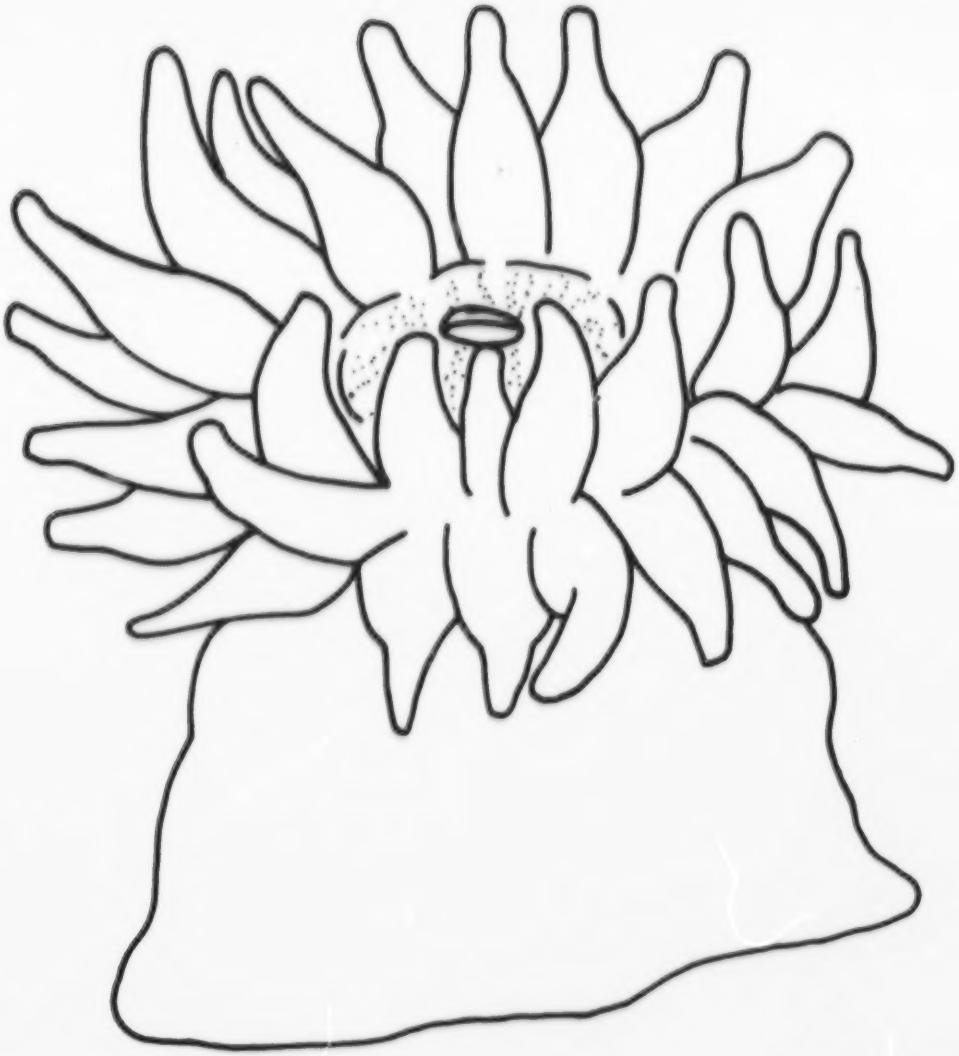
Snails



Hermit crab

4-F

Barnacles

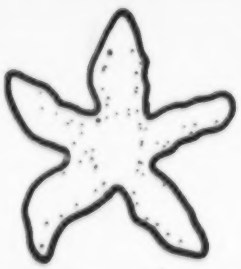


Anemone

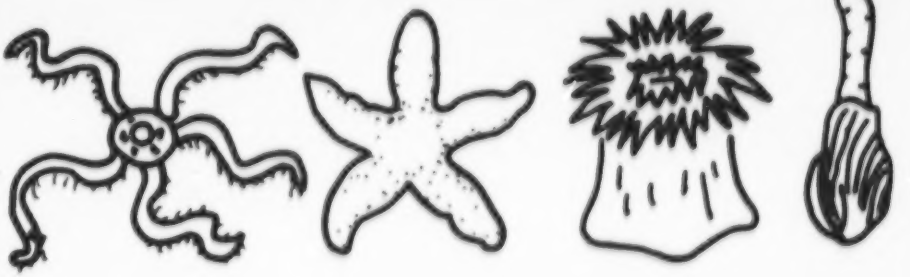
4-H

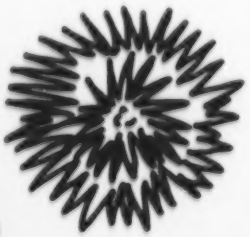
Beach Matching

Directions: Circle and color the matching sea animals.

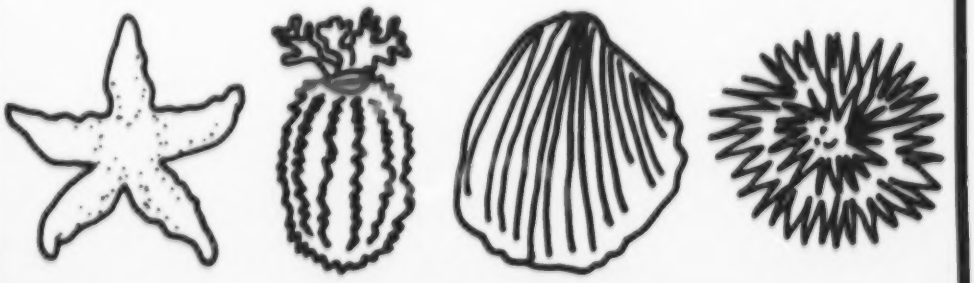


Sea star

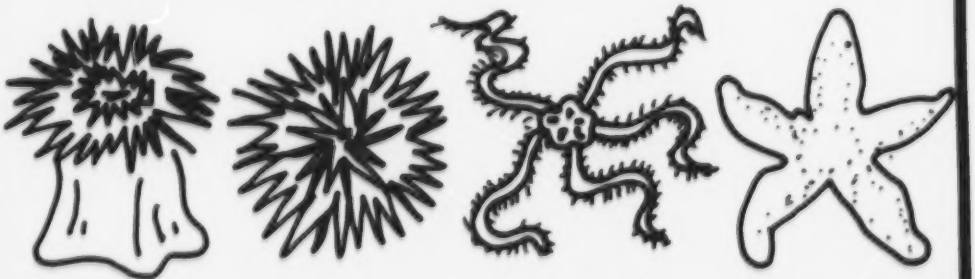




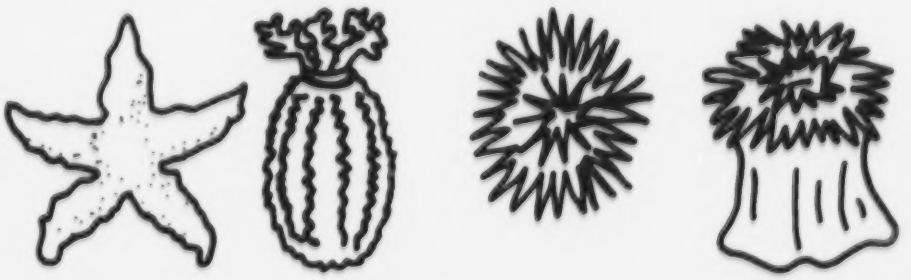
Sea urchin



Brittle star

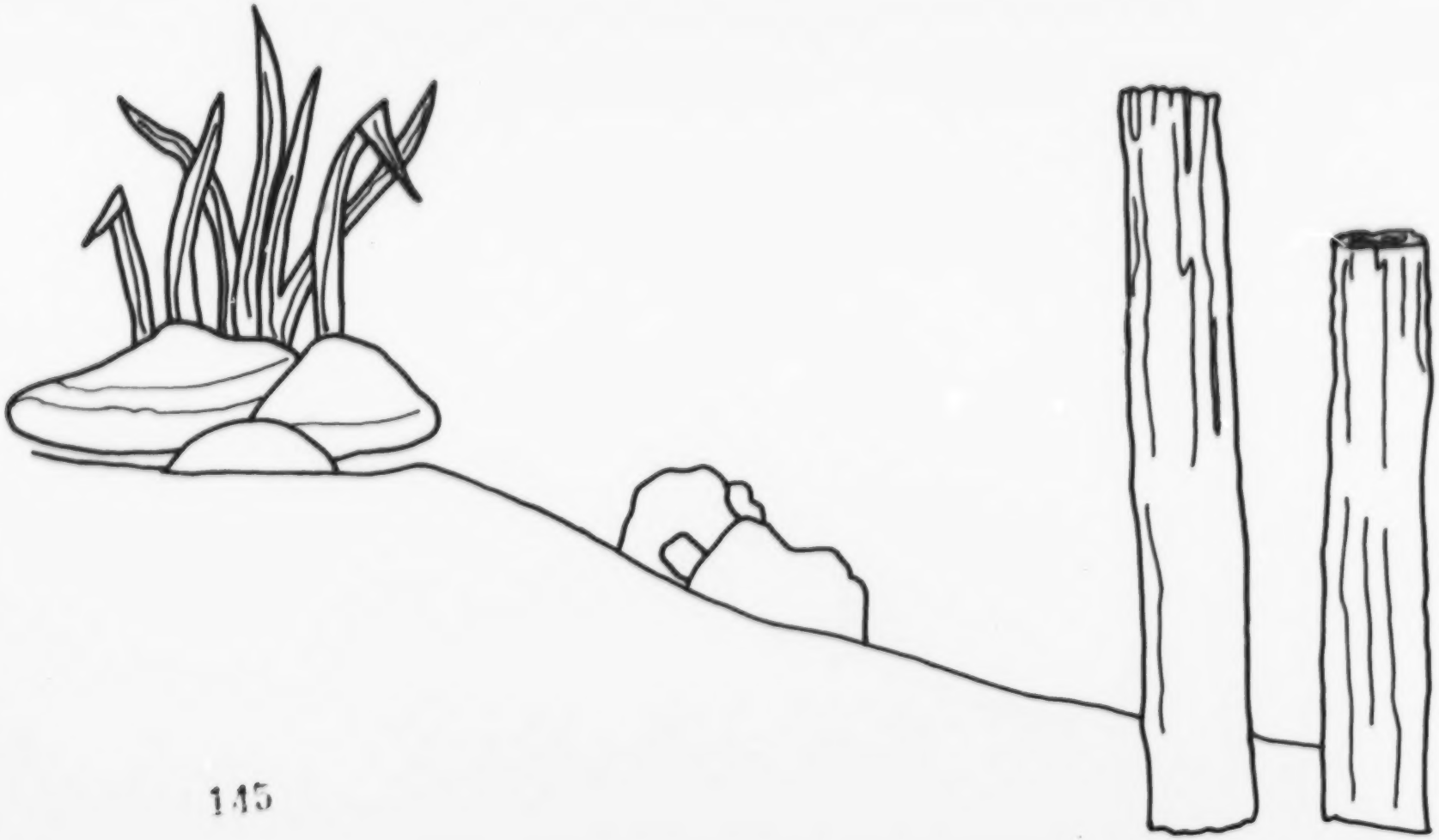


Sea cucumber



Beach Animals

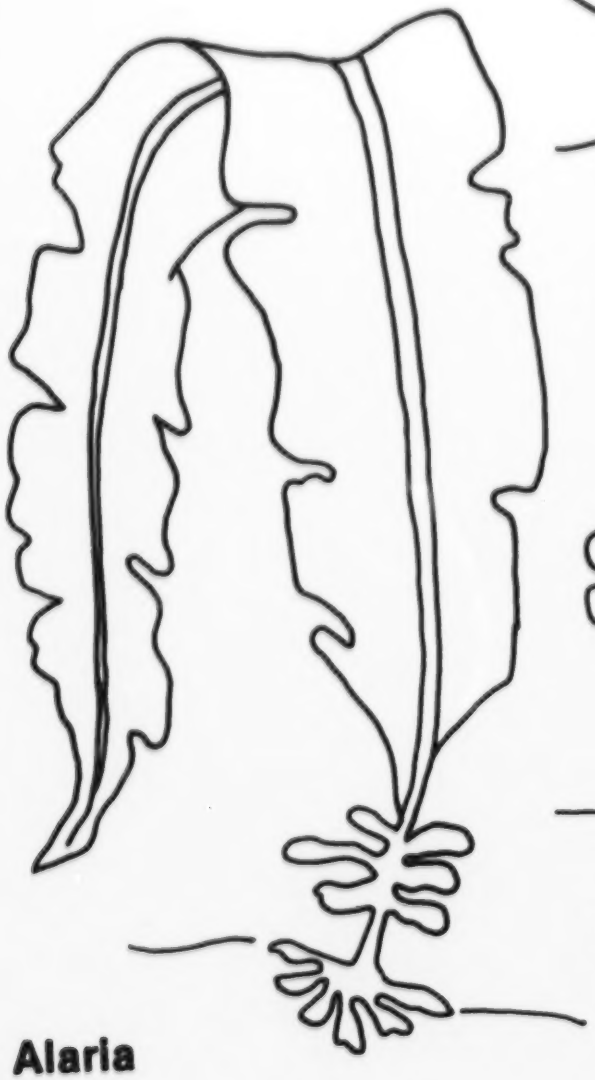
Directions: Draw some of the things you found at the beach.



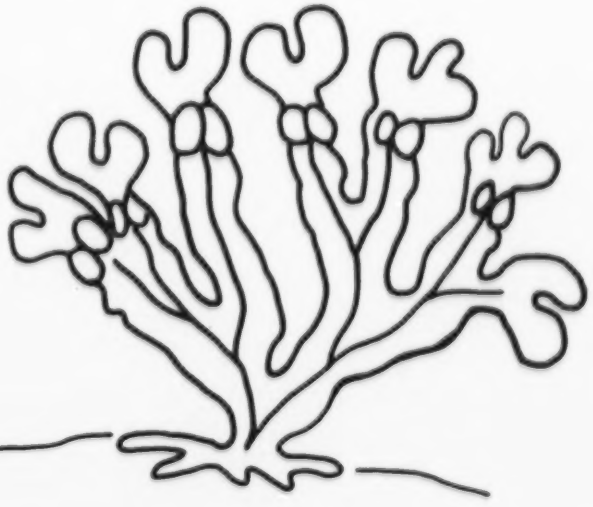
5-A

Holdfast

Dulce



Alaria

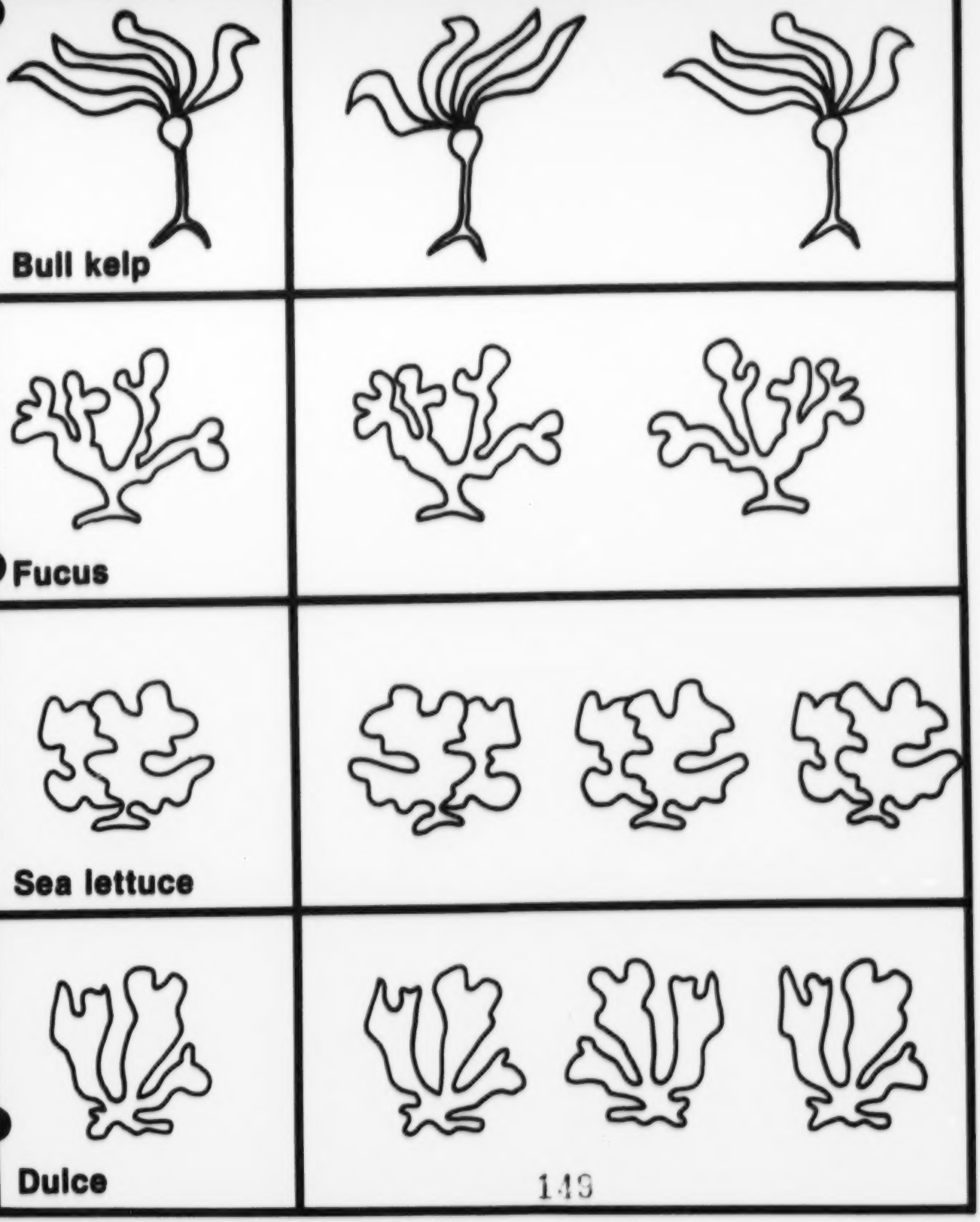


Fucus

Bull kelp

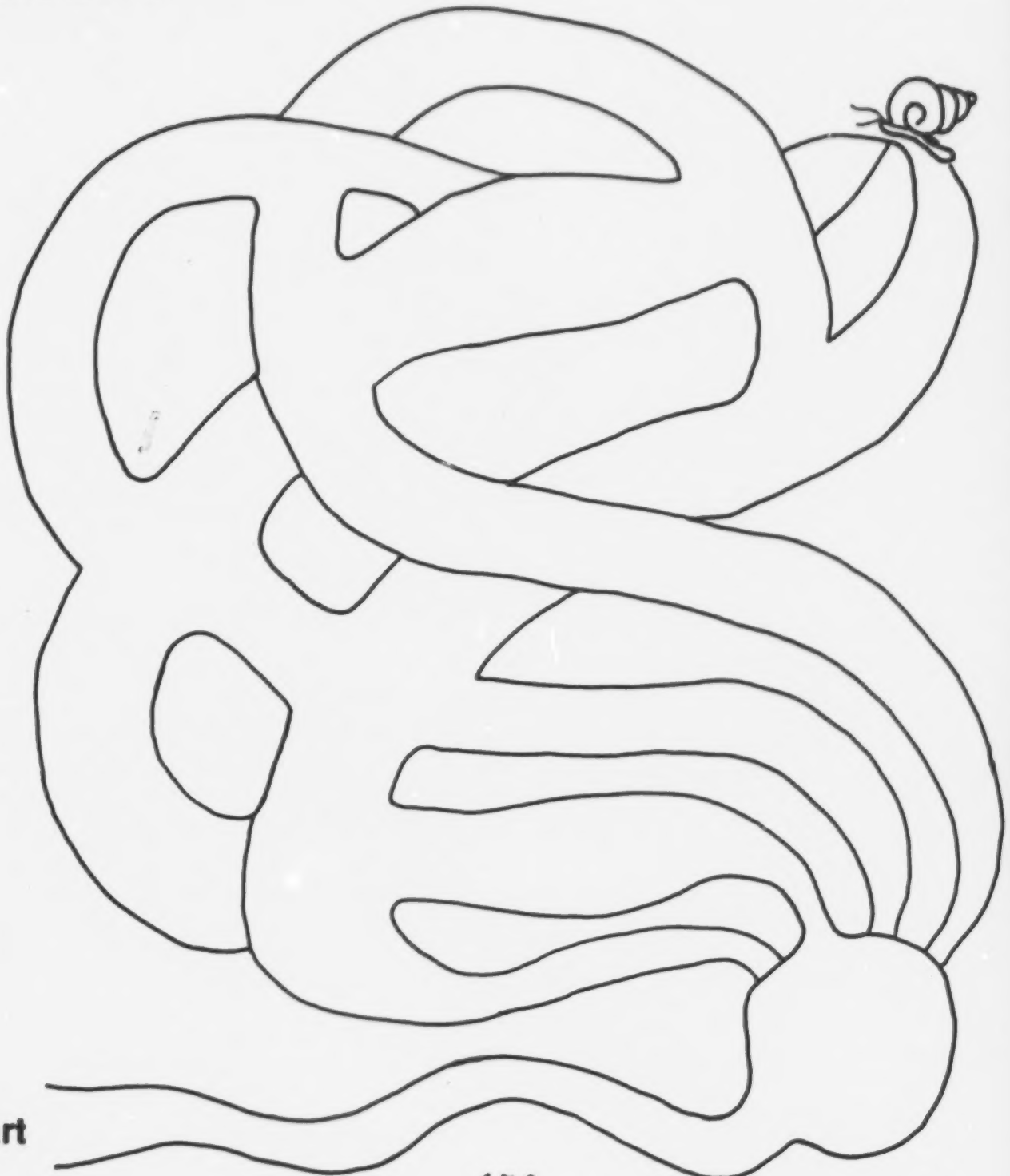
Seaweed Matching

Directions: Circle or color the seaweeds that are exactly the same.

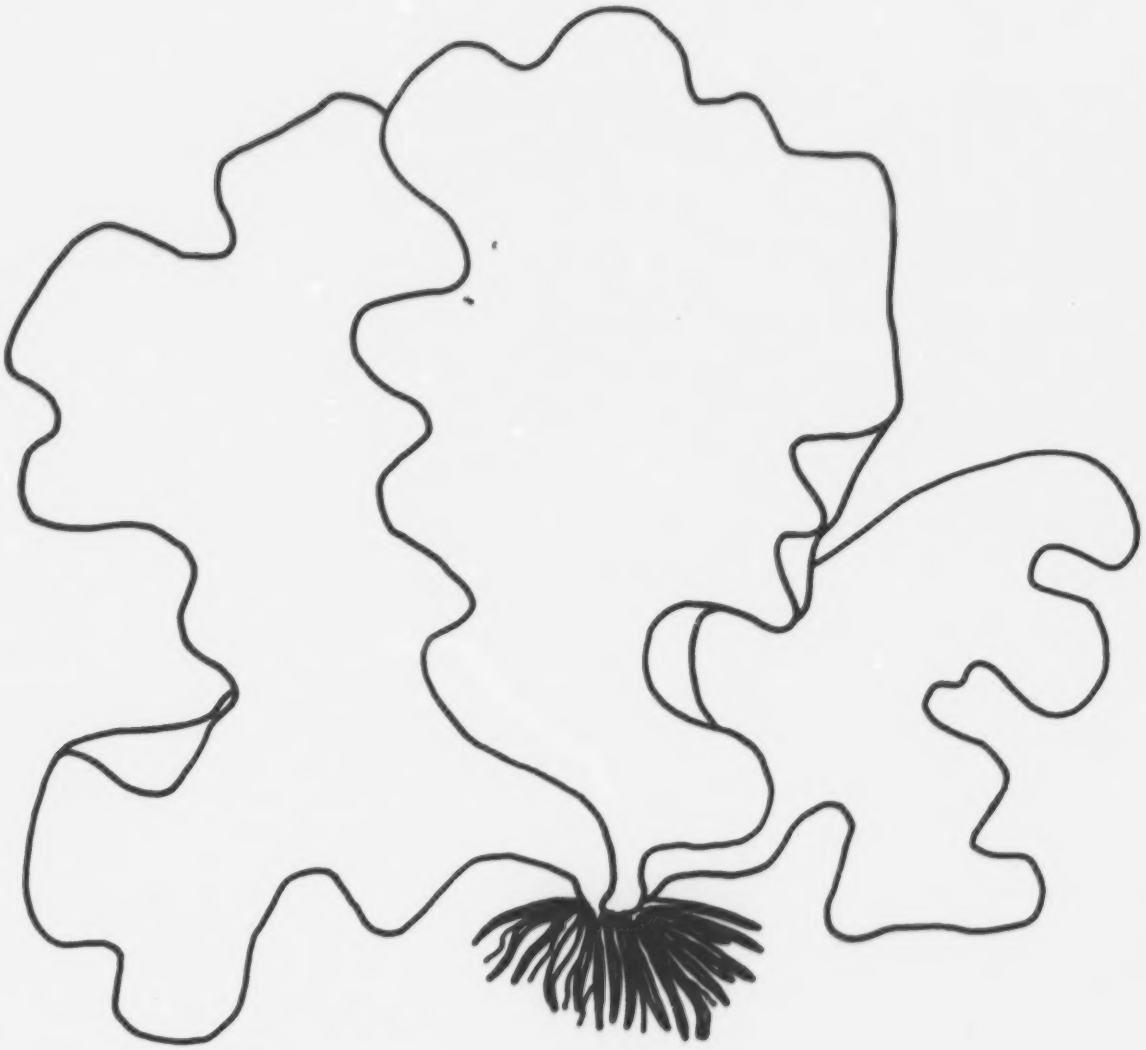


Bull Kelp Maze

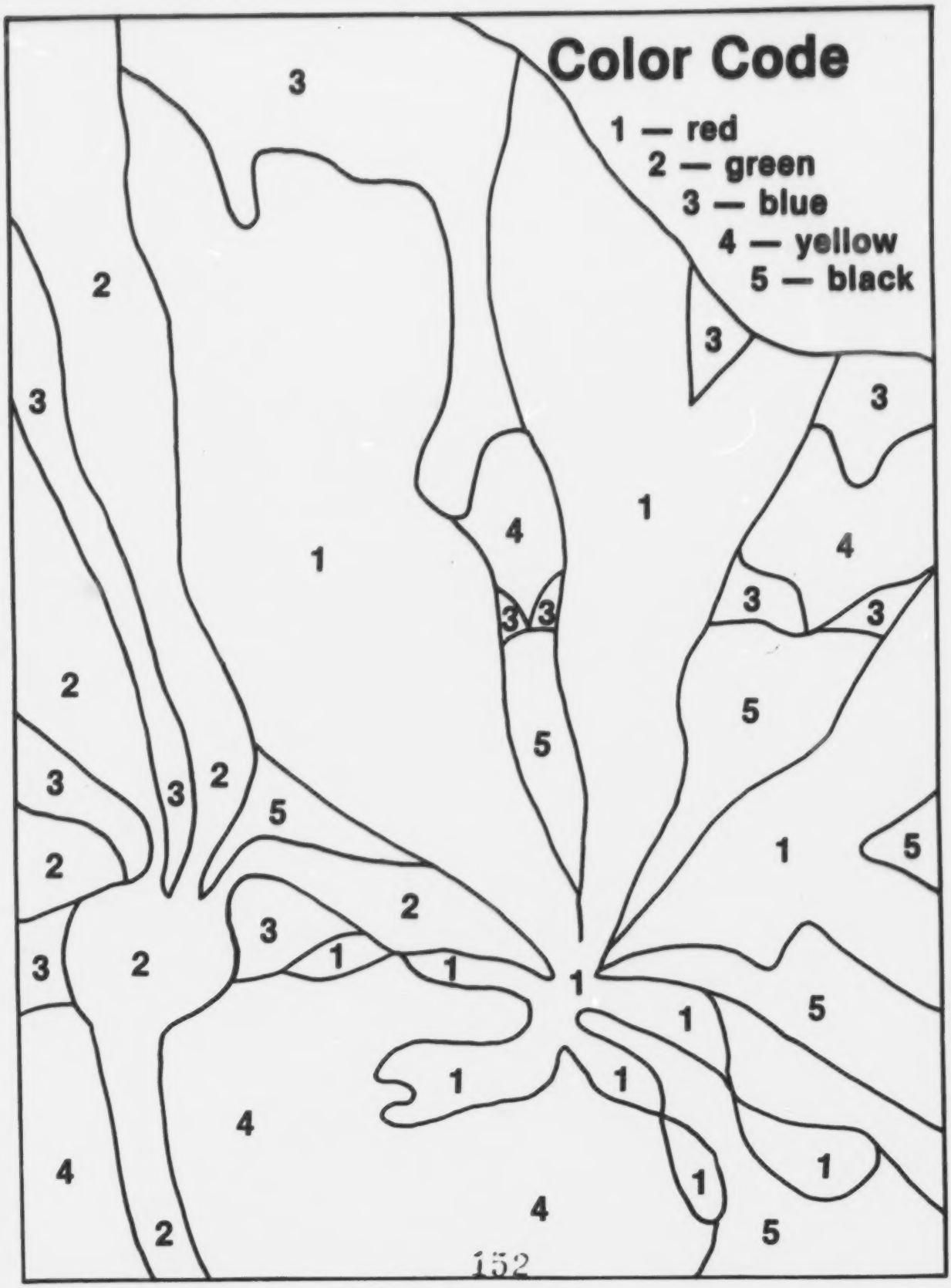
Directions: Draw a line from the kelp stalk to the snail on the kelp blade. Do not cross any black lines.



Start

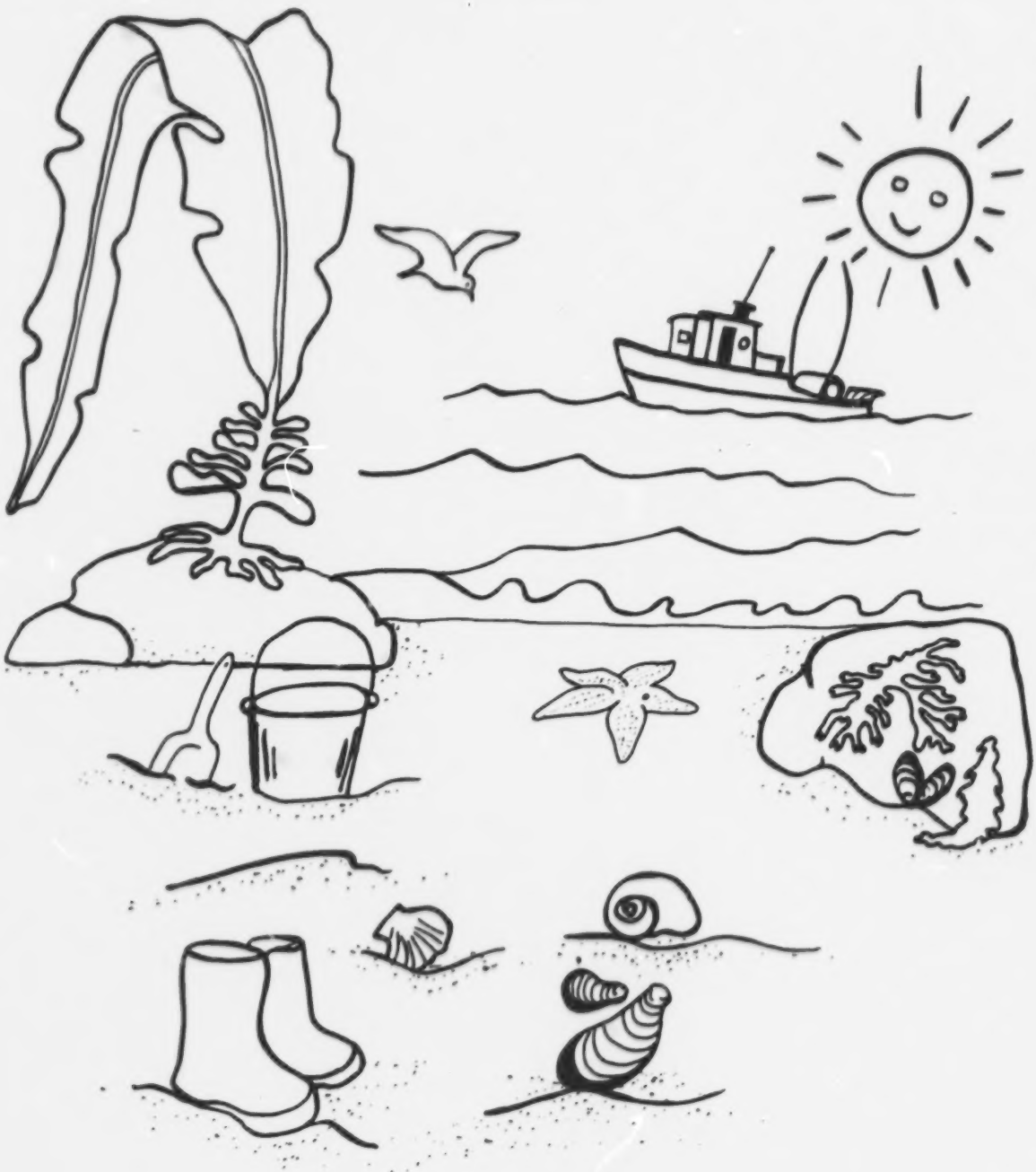


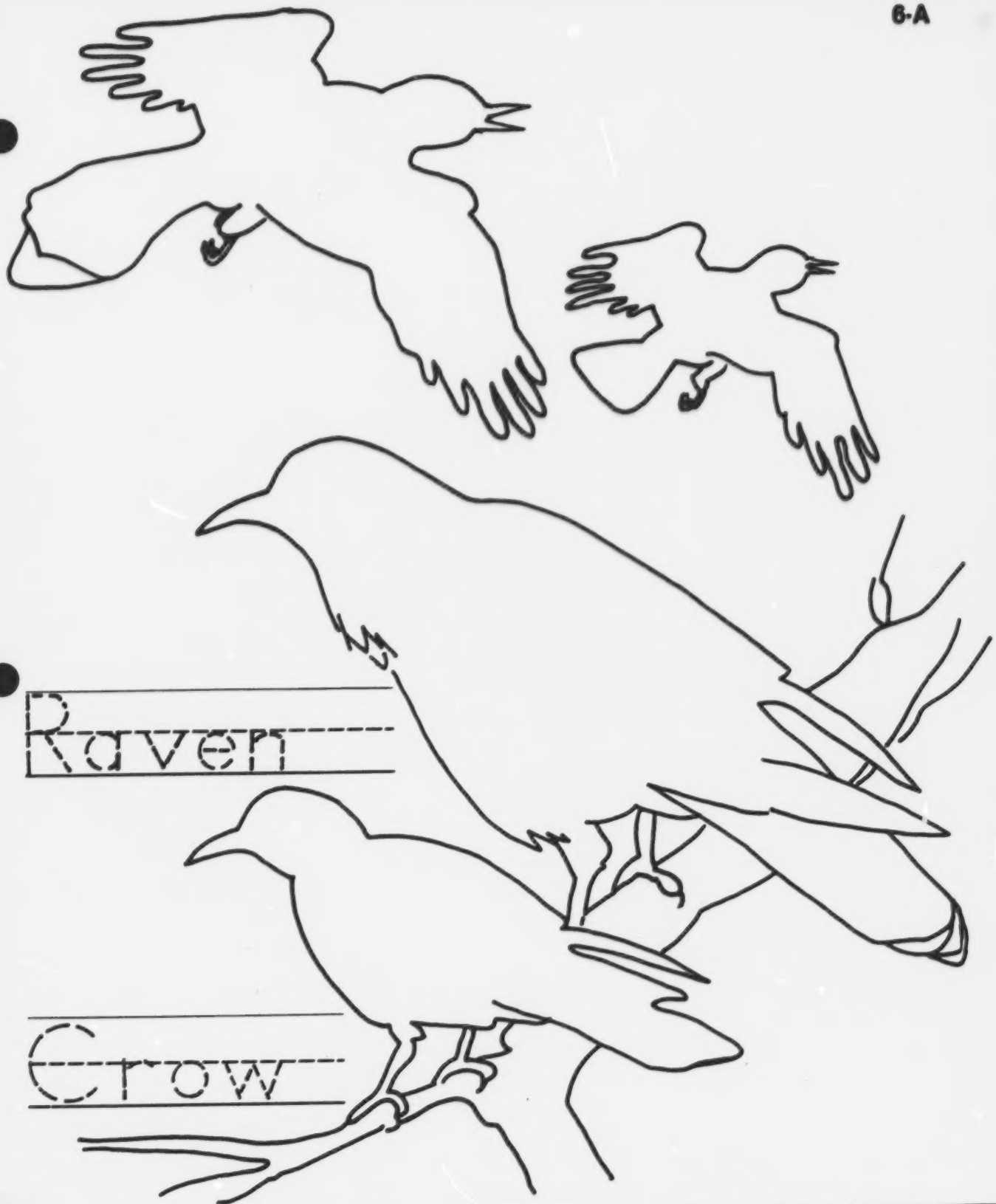
Sea lettuce


Color Code
1 — red
2 — green
3 — blue
4 — yellow
5 — black

"S" is for Seaweed

Directions: Circle the "S" pictures.

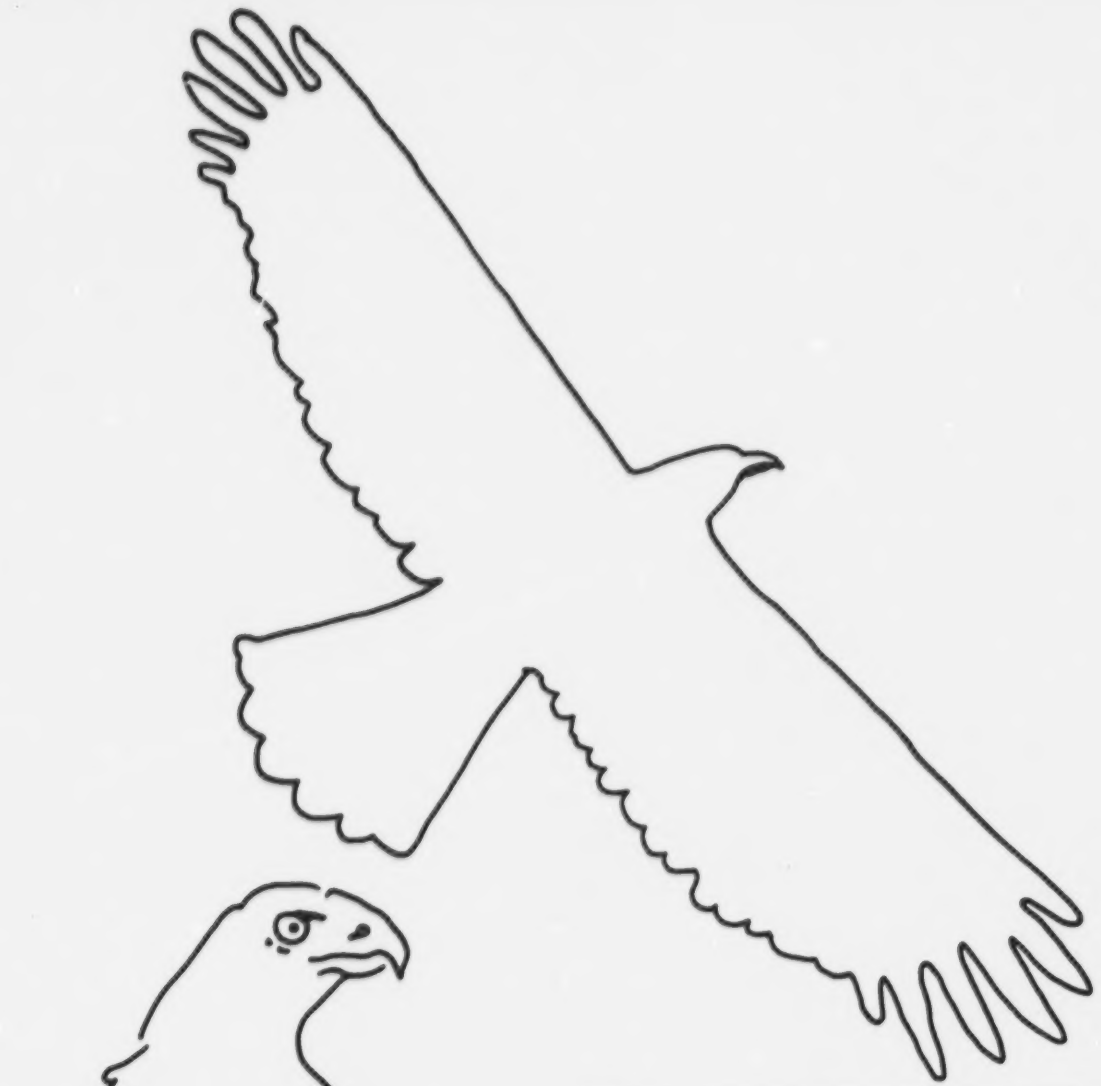


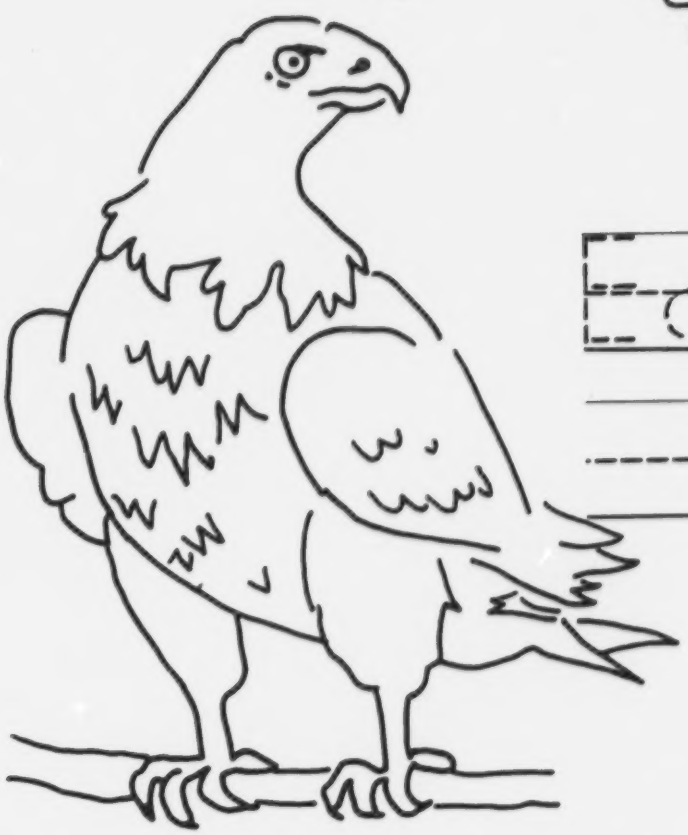


Raven

Crow

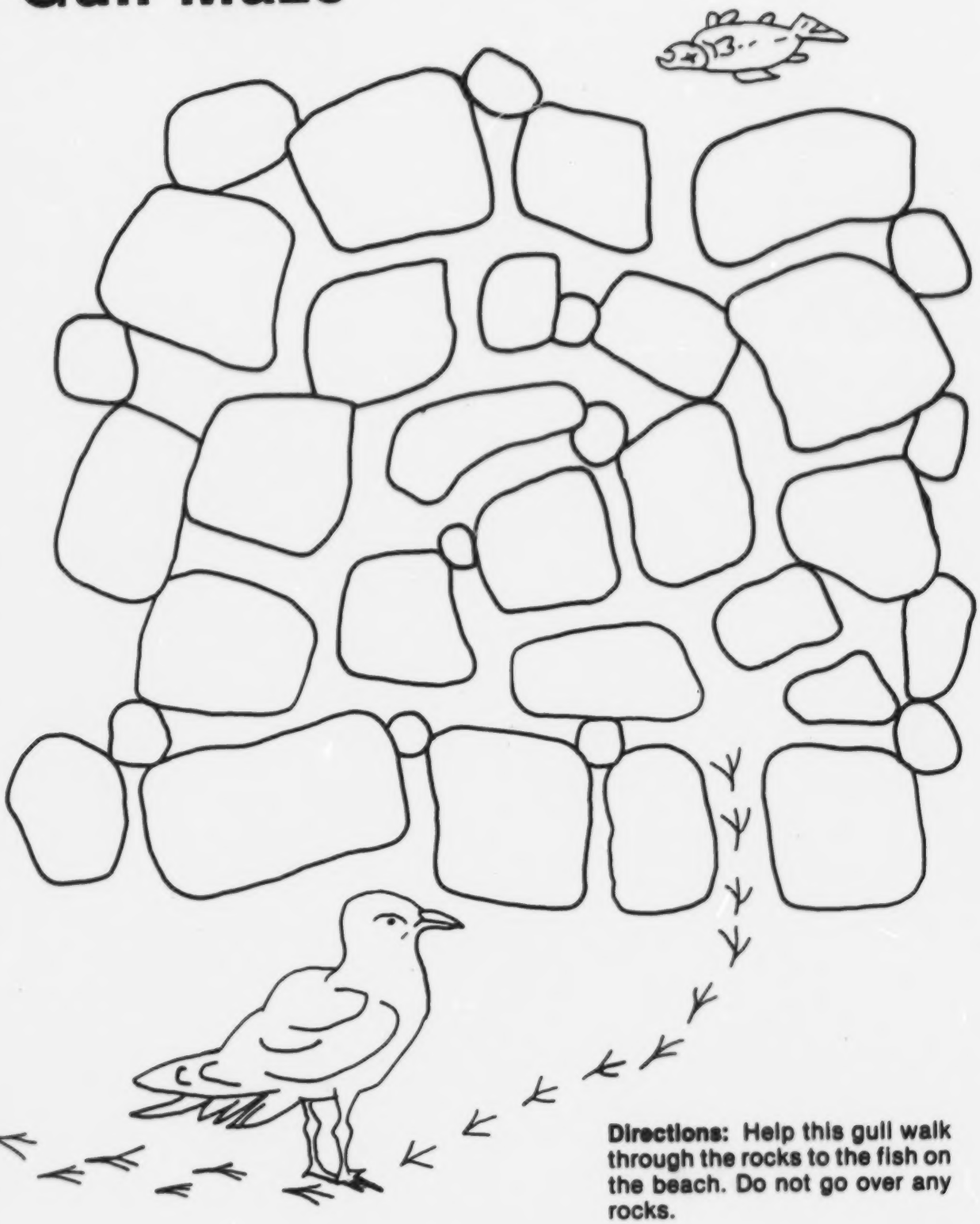
6-B



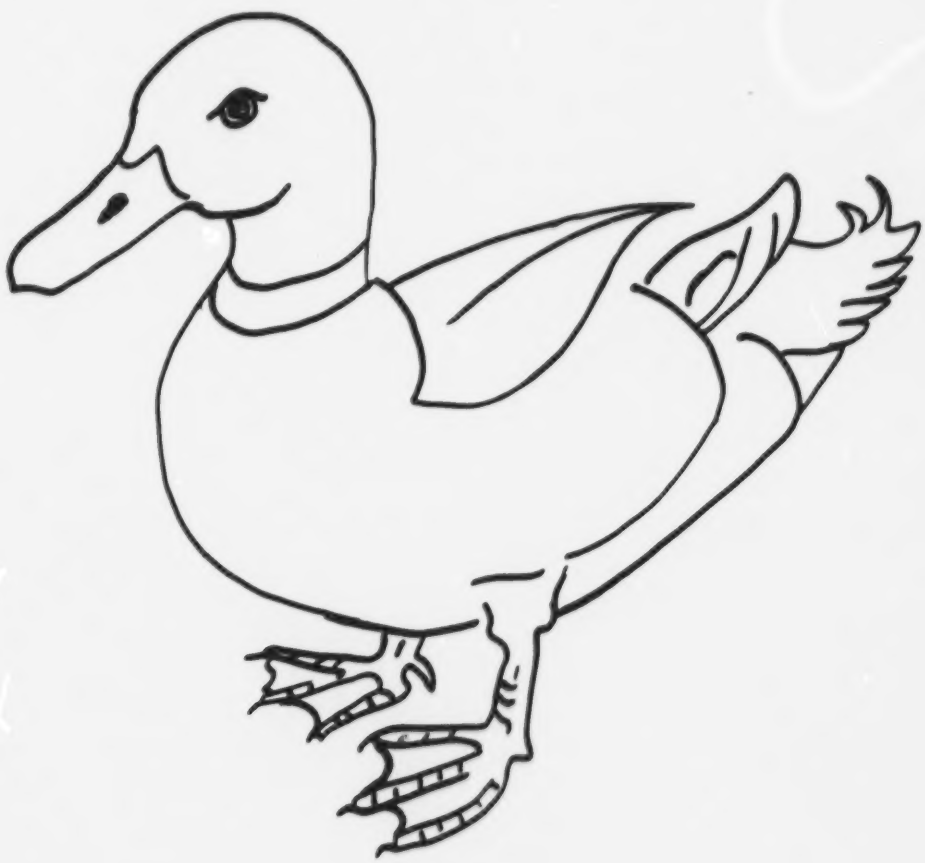


Eagle

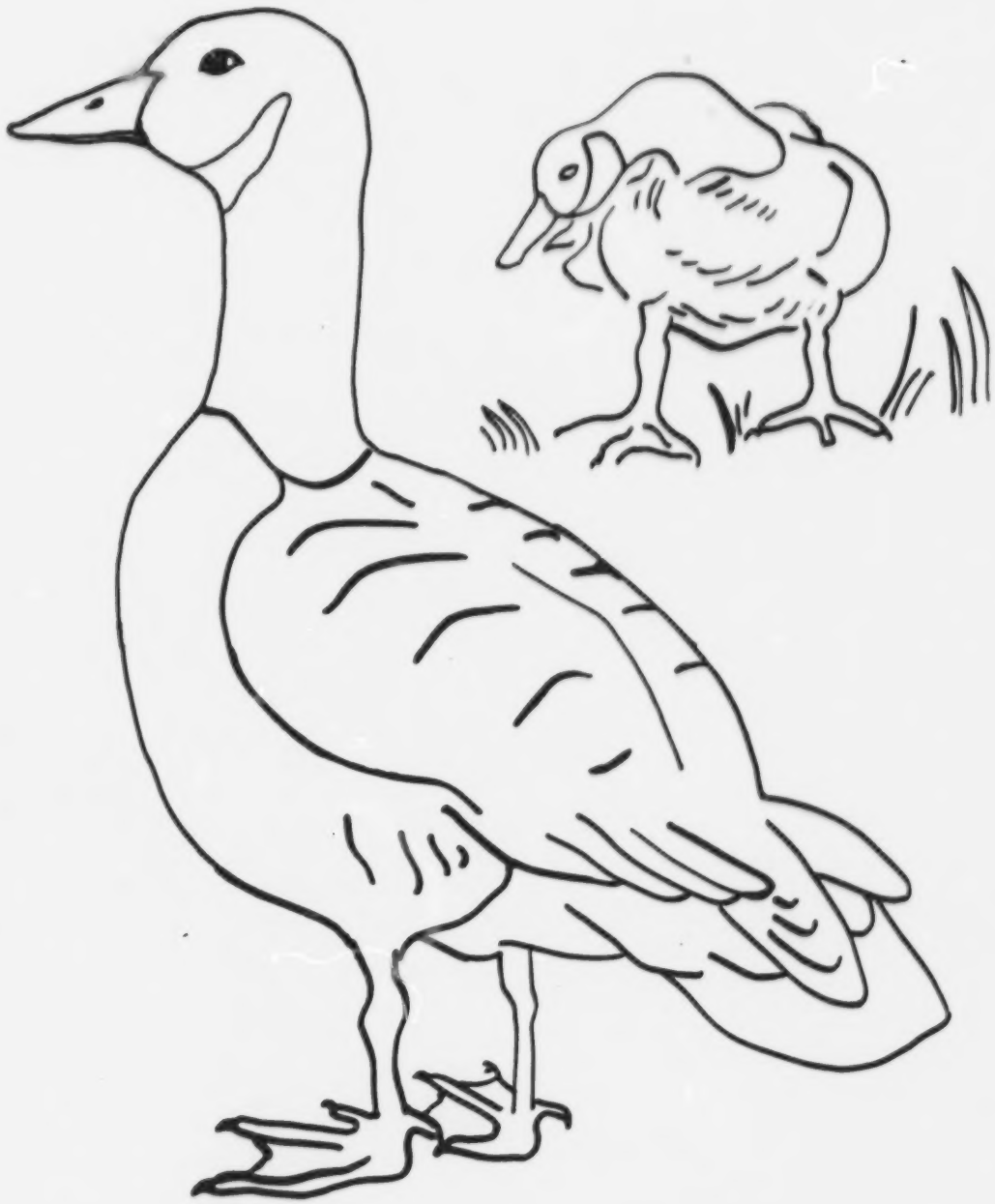
Gull Maze



Directions: Help this gull walk through the rocks to the fish on the beach. Do not go over any rocks.



Duck

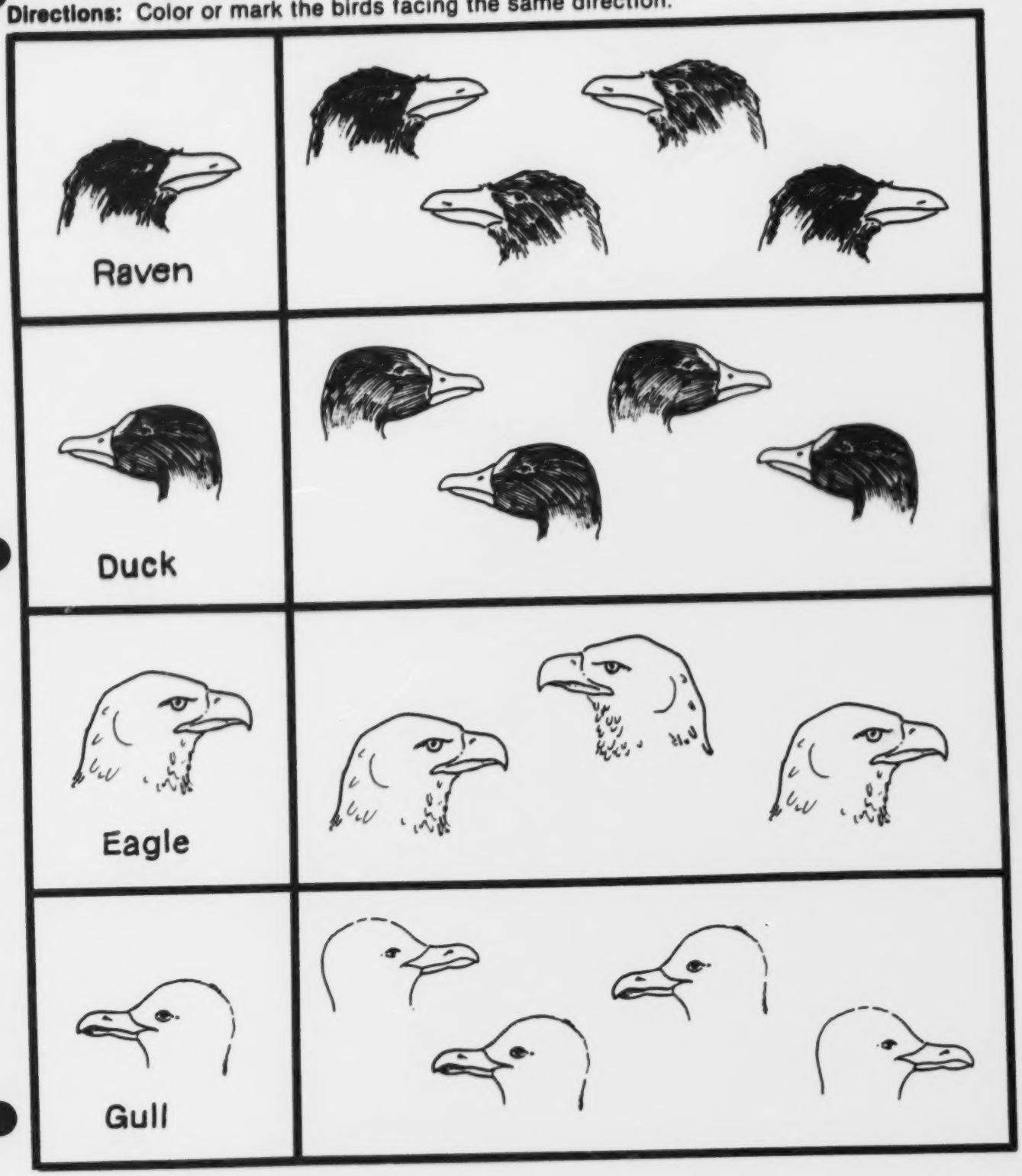


Goose

6-F

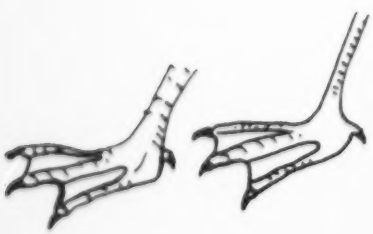
Bird Match

Directions: Color or mark the birds facing the same direction.



Bird Head and Feet Matching

Directions: Draw lines from the bird feet to the correct bird head.



ISBN 1-56612-019-5

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